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IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION

SVV TECHNOLOGY INNOVATIONS, INC., Plaintiff, v. ASUSTeK COMPUTER INC., Defendant.	Civil Action No. 6:22-cv-00311-ADA Civil Action No. 6:22-cv-00312-ADA Civil Action No. 6:22-cv-00313-ADA JURY DEMANDED

DEFENDANT ASUSTeK COMPUTER INC.'S *DAUBERT* MOTION TO EXCLUDE CERTAIN OPINIONS OF THOMAS L. CREDELLE OR, IN THE ALTERNATIVE, STRIKE PORTIONS OF HIS INFRINGEMENT REPORT

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Defendant ASUSTeK Computer Inc. ("ASUSTeK") seeks to exclude or strike from his September 12, 2023 Infringement Report certain opinions of Plaintiff's technical expert, Mr. Thomas L. Credelle, on the following grounds: (1) opinions based on the Innography service are speculative, unreliable, and not beyond the grasp of a lay jury; (2) direct infringement opinions based on violations of Section 271(g) are not supported by the evidence;[1] (3) opinions on ASUSTeK's knowledge of the patents and intent to induce infringement by others, and ASUSTeK's vicarious liability, are legal conclusions that usurp the role of the court and jury; and (4) certain opinions regarding the comparability of a patent license agreement between ASUSTeK and a third party are legal conclusions.

I. BACKGROUND

Mr. Credelle is an engineer with a Master's degree in electrical engineering who is offered by Plaintiff to provide technical opinions regarding the asserted patents. While Mr. Credelle's Infringement Report primarily relates to his technical analysis of ASUSTeK's alleged infringement of the asserted patents, it also includes several sections that purport to offer opinions regarding: 1) an IP intelligence service's (known as Innography) "percentile rank" assigned to each of the asserted patents and certain patents that a third party ("MSI") assigned to Plaintiff; 2) ASUSTeK's direct infringement under Section 271(g) by importing accused products; 3) ASUSTeK's knowledge of certain facts and/or its alleged intent to induce infringement by others, and ASUSTeK's alleged vicarious liability; 4) whether the patented technology licensed by ASUSTeK from [redacted] is comparable to the patented technology asserted by Plaintiff in this case. Specifically, Mr. Credelle offers the

[1] This issue is also addressed in ASUSTeK's Motion for Summary Judgment, filed concurrently herewith.

following opinions:

- Mr. Credelle states that [redacted][2] Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶¶ 109-111).[3]

- Mr. Credelle opines that [redacted] Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶¶ 148, 151, 159); Credelle Infr. Charts, at Exs. 327-328, 340-342, 350-351, 356-357 ('135 Patent, claim 21).[4]

- [redacted] Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶ 140 (emphasis added)).

- [redacted] Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶ 155 (emphasis added)).

- [redacted] Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶ 156 (emphasis added)).

- [redacted]

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[2] Notably, one of the patents assigned by [redacted] to Plaintiff was ranked in the [redacted] percentile, yet Mr. Credelle states the [redacted]. Shaw Decl., Ex 1 (Credelle Infr. Rep., at ¶¶ 112-113).

[3] Relevant excerpts from Mr. Credelle's Infringement Report are attached as Exhibit 1 to the Shaw Declaration in Support of ASUSTeK's *Daubert* Motion filed concurrently ("Shaw Decl.").

[4] Mr. Credelle's Infringement Charts themselves are not the direct subject of ASUSTeK's *Daubert* Motion and therefore are not included as exhibits to the Motion.

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[redacted] Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶ 157 (emphasis added)).

- [redacted] Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶ 158 (emphasis added)).
- [redacted] Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶ 159 (emphasis added)).
- [redacted]

[redacted] Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶ 160 (emphasis added)).

- [redacted] Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶ 161 (emphasis added)).

- [redacted] Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶ 162 (emphasis added)).

- In comparing the technology ASUSTeK licensed from [redacted] Mr. Credelle also states: [redacted]

> [redacted] Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶ 115 (emphasis added)).

II. LEGAL STANDARD

An expert may testify on subjects only if: (1) the expert's scientific, technical, or other specialized knowledge will help the trier of fact understand the evidence or determine a fact in issue; (2) the testimony is based on sufficient facts or data; (3) the testimony is the product of reliable principles and methods; and (4) the expert has reliably applied the principles and methods. *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 591-94 (1993); Fed. R. Evid. 702. Plaintiff has the burden to show its experts' testimony is admissible. *Neely v. PSEG Tex., LP*, 2012 WL 12877923, at *2 (W.D. Tex. 2012) (citing *Bourjaily v. U.S.*, 483 U.S. 171, 175-76 (1987)). Plaintiff must establish that "[t]he expert's testimony [is] reliable at each and every step or else it is inadmissible." *Knight v. Kirby Inland Marine Inc.*, 482 F.3d 347, 355 (5th Cir. 2007); *see Moore v. Ashland Chem. Inc.*, 151 F.3d 269, 278 n.10 (5th Cir. 1998) ("[A]ny step that renders the [expert's] analysis unreliable … renders the expert's testimony inadmissible."). Expert testimony should be excluded based on reliability concerns "if it is speculative or conjectural or based on assumptions that are so unrealistic and contradictory as to suggest bad faith or to be in essence an apples and oranges comparison." *Zerega Ave. Realty Corp. v. Hornbeck Offshore Transp.*, LLC, 571 F.3d 206, 213–14 (2d Cir. 2009) (internal quotation marks omitted). The Court's gatekeeping obligation "applies not only to testimony based on 'scientific' knowledge, but also to testimony based on 'technical' and 'other specialized' knowledge." *Kumho Tire Co., Ltd. v. Carmichael*, 526 U.S. 137, 141 (1999) (citing Fed. R. Evid. 702).

III. ARGUMENT

A. Mr. Credelle Should Be Precluded From Offering Testimony On The "Strength," "Value," Or Presence Of Objective Indicia Of Non-Obviousness Of The Asserted Patents Because They Are Legal Conclusions And Speculative

Mr. Credelle relies on percentile ranking data generated by a service known as Innography to opine that the asserted patents "rank highly," are "strong" and "valuable," and that the rankings indicate the presence of "objective indicia" of non-obviousness because their percentile scores rank above the [redacted] percentile. Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶¶ 109-111). He provides the patents' ranking in a table, which is partially reproduced below:

Patent Number	PatentStrength
US8290318	[redacted]
US8740397	
US9678321	
US9880342	
US10269999	
US10439088	
US10439089	
US10613306	
US10627562	
US10797191	
US10838135	
US10868205	
US11276795	

Initially, Mr. Credelle offers no explanation, background, comparisons, past experience or other analysis why rankings above the [redacted] percentile warrant his opinions that the patents are "strong" and "valuable," or indicate the presence of objective indicia of non-obviousness. *See* Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶¶ 109-111). In fact, it appears that Mr. Credelle's cutoff at the [redacted] percentile is wholly arbitrary. Further, interpretation of Innography's patent strength "ranking" does not require an expert's technical explanation because interpretation of the rankings would be understandable to a jury, i.e., Mr. Credelle is in no better position than the jury to assess

Innography's rankings and come to such conclusions. *United States v. Bilzerian*, 926 F.2d 1285, 1294 (2nd Cir. 1991) ("although an expert may opine on an issue of fact within the jury's province, he may not give testimony stating ultimate legal conclusions based on those facts").

Additionally, while data relied on by an expert does not need to be admissible, it "cannot be derived from a manifestly unreliable source." *Power Integrations, Inc. v. Fairchild Semiconductor Int'l, Inc.*, 711 F.3d 1348, 1373 (Fed. Cir. 2013). In determining whether the expert's methodology was reliable, courts have established that an expert's speculative testimony is not reliable. *Id.*, at 1373-74. Here, Mr. Credelle has not shown Innography is an accepted, reliable method used by persons of ordinary skill in the relevant art to evaluate or assess the strength or value of patents. *See* Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶¶ 109-111). In fact, it is just the opposite. Innography's rankings are subjective, speculative and unreliable as shown in the table below, which is a compilation of patents that are "highly ranked" by Innography[5] yet were invalidated in litigation or in administrative proceedings[6] before the USPTO:

Patent Number	PatentStrength Ranking	Current Legal Status
US6261664	**82**	**Invalidated**: *Advanced Display Techs. of Texas v. AU Optronics Corp.*, Case No. 6:11-CV-00011-LED, D.I. 229 (E.D. TX July 12, 2012)
US7523373	**90**	**Invalidated**: *Patent Quality Assurance, LLC v. VLSI Tech. LLC*, IPR2021-01229, Paper No. 129 (P.T.A.B. 2023)
US7725759	**91**	**Invalidated**: *Intel Corp. v. VLSI Tech. LLC*, IPR2021-01064, Paper No. 135 (P.T.A.B. 2023)
US6970083	**91**	**Invalidated**: *Canon Inc.* v. *Avigilon Fortress Corp.*, IPR2017-01833, Paper No. 31 (P.T.A.B. 2019)
US7268588	**92**	**Invalidated**: *Intel Corp. v. VLSI Tech. LLC*, IPR2018-01035, Paper No. 32 (P.T.A.B. 2020)

[5] A true and correct copy of the Innography Report assigning the PatentStrength Ranking for the listed patents is attached as Exhibit 2 to the Shaw Decl.
[6] True and correct copies of district court and PTAB decisions that do not include citations to a Federal Reporter are attached as Exhibits 4 through 12 to the Shaw Decl.

US7608597	**92**	**Invalidated**: *Idenix Pharmaceuticals LLC v. Gilead Sciences Inc.*, 941 F.3d 1149 (Fed. Cir. 2019)
US7709303	**92**	**Invalidated**: *Intel Corp. v. VLSI Tech. LLC*, IPR2018-01105, Paper No. 44 (P.T.A.B. 2019)
US7896742	**91**	**Invalidated**: *Creative Kingdoms, LLC v. ITC*, 588 F. App'x 993 (Fed. Cir. 2014)
US7936370	**94**	**Invalidated**: *Sensormatic Elecs., LLC v. Wyze Labs, Inc.*, No. 1:19-cv-01543, D.I. 97 (D. Del. 2020)
US7954129	**92**	**Invalidated**: *Sensormatic Elecs., LLC v. Wyze Labs, Inc.*, No. 1:19-cv-01543, D.I. 97 (D. Del. 2020)
US8208019	**93**	**Invalidated**: *Sensormatic Elecs., LLC v. Wyze Labs, Inc.*, No. 1:19-cv-01543, D.I. 97 (D. Del. 2020)
US8577813	**92**	**Invalidated**: *Universal Secure Registry LLC v. Apple Inc.*, No. 1:17-cv-00585, D.I. 167 (D. Del. 2020)
US8610772	**92**	**Invalidated**: *Sensormatic Elecs., LLC v. Wyze Labs, Inc.*, No. 1:19-cv-01543, D.I. 97 (D. Del. Sept. 3, 2020)
US9072752	**88**	**Invalidated**: *Rimfrost AS. v. Aker Biomarine Antarctic AS.*, IPR2018-01730, Paper No. 35 (P.T.A.B. 2020)
US9100826	**91**	**Invalidated**: *Universal Secure Registry LLC v. Apple Inc.*, No. 1:17-cv-00585, D.I. 167 (D. Del. 2020)
US9530137	**91**	**Invalidated**: *Universal Secure Registry LLC v. Apple Inc.*, No. 1:17-cv-00585, D.I. 167 (D. Del. 2020)

As can be deduced from the above information, Innography's "PatentStrength" score is unreliable because it cannot be correlated to a patent's *validity or invalidity*—a fundamental threshold determination also underpinning the value or strength of a patent. Indeed, an invalid patent cannot be enforced and therefore its value, or strength, is zero.

Because the data Mr. Credelle relies on is unreliable, Mr. Credelle's opinions relating to the "strength" or "value" of patents, or the presence of objective indicia of non-obviousness are themselves unreliable. Accordingly, those opinions should be stricken.

B. Mr. Credelle's Direct Infringement Opinions Under Section 271(g) Are Unreliable Because ASUSTeK [redacted] The U.S.

Section 271(g) provides in relevant part: "[w]hoever without authority *imports* into the United States or *offers to sell, sells, or uses within the United States* a product which is *made by a process patented in the United States* shall be liable as an infringer, if the importation, offer to sell,

sale, or use of the product occurs during the term of such process patent." 35 USC § 271(g) (emphasis added). Mr. Credelle opines that [redacted] Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶¶ 148, 151, 159); Credelle Infr. Charts, at Exs. 327-328, 340-342, 350-351, 356-357.

However, ASUSTeK [redacted] accused of infringement under Section 271(g).[7] ASUSTeK [redacted] The accused products [redacted] Therefore, ASUSTeK cannot be liable for direct infringement of claim 21 of the '135 Patent under Section 271(g).

The cycle for the development, manufacture and sale of ASUS-branded products works as follows: [redacted] accused of infringement by Plaintiff. Shaw Decl., Ex. 3 (Wu Depo., at pp. 31-32).

[7] The facts recited in these paragraphs are also set forth in ASUSTeK's Motion for Summary Judgment (Undisputed Facts section).

[8] The [redacted] that ASUSTeK [redacted] Shaw Decl. Ex. 13 (Lee Depo. at pp. 18-19).

Therefore, ASUSTeK [redacted] Similarly, ASUSTeK [redacted] And finally, ASUSTeK [redacted] ASUSTeK therefore cannot be liable for direct infringement of any of the accused products, including under Section 271(g).

C. Mr. Credelle's Opinions Espousing Legal Conclusions Are Inadmissible

1. Opinions Regarding ASUSTeK's Knowledge And Intent To Induce Infringement, And ASUSTeK's Vicarious Liability Are Inadmissible Legal Conclusions

Under Federal Rule of Evidence 702, experts may not provide opinions regarding the intent of the parties or other subjective opinions about the knowledge of the parties. *See Arista Networks, Inc. v. Cisco Sys., Inc.*, No. 16-cv-00923-BLF, 2018 WL 8949299, at *2 (N.D. Cal. June 15, 2018) (excluding expert testimony on corporate intent or beliefs of others); *Finjan, Inc. v. Blue Coat Sys., Inc.*, 13-cv-03999-BLF, 2015 WL 4272870, at *3 (N.D. Cal. July 14, 2015) (striking technical expert testimony and stating that "[w]hile [the technical experts] may certainly testify to the objective 'technical merits' of Plaintiff's patents, [], what Defendant thought about Plaintiff's patents is not the proper subject of expert testimony, nor are [the technical experts] qualified to offer opinions regarding Defendant's subjective beliefs.") As plainly stated in *Therasense, Inc. v. Becton, Dickinson & Co.*, No. C 4-04-2123 WHA, 2008 WL 2037732, at *4 (N.D. Cal. May 12, 2008): "It bears repeating that no expert of any kind will be allowed to speculate as to anyone's subject intent or knowledge."

Here, Mr. Credelle repeatedly opines that ASUSTeK [redacted]

induced infringement of the patents by others because: [redacted]

Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶¶ 140, 155-156, 159, 160-162).

Mr. Credelle's testimony, which will include his opinions regarding what ASUSTeK "knew" or "should have known" and what ASUSTeK "intended" about [redacted] is not proper under Federal Rule of Evidence 702. Mr. Credelle's indirect infringement opinions regarding ASUSTeK's knowledge and intent are not "scientific, technical, or other specialized knowledge [that] will help the trier of fact" under Federal Rule of Evidence 702(a), and they are not "based on sufficient fact or data," as required under Federal Rule of Evidence 702(b). *See Arista Networks*, 2018 WL 8949299, at *2 (excluding expert testimony on corporate intent or beliefs of others); *Finjan*, 2015 WL 4272870, at *3 (striking technical expert testimony regarding defendant's alleged subject beliefs and thoughts).

Although Mr. Credelle purports to base his improper conclusions regarding ASUSTeK's knowledge and intent on a series of documents and deposition testimony (*see* Shaw Decl., Ex. 1 (Credelle Infr. Rep. at ¶¶ 140, 155-156, 159, 160-162)), all of those documents and testimony would be understandable by the jury, and do not require the testimony of a technical expert in order to be interpreted. Mr. Credelle's opinions regarding ASUSTeK's knowledge and intent with respect to indirect infringement should not be allowed because the testimony amounts to nothing more than an impermissible vouching for Plaintiff's interpretation of the evidence, thereby

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usurping the jury's role and function. *See Prime Media Grp., LLC v. Acer Am. Corp.*, No. 12-cv-05020-BLF, 2015 WL 452192, at *7 (N.D. Cal. Jan. 22, 2015) (excluding expert testimony that "appears to be simply performing the role of a jury"); *Arista*, 2018 WL 8949299, at *3 (citing *United States v. Freeman*, 498 F.3d 893, 903 (9th Cir. 2007)) (excluding expert testimony as "simply vouching for fact evidence rather than providing expert opinions"). Accordingly, the Court should exclude Mr. Credelle's improper indirect infringement opinions because it would usurp the role of the jury to weigh and assess the facts and the Court's role on instructing the jury on the law.[9]

Similarly, Mr. Credelle opines that ASUSTeK [redacted] Shaw Decl., Ex. 1 (Credelle Infr. Rep. at ¶¶ 152-153 & 157-158). Again, these are opinions that merely vouch for Plaintiff's interpretation of the evidence, do not require any technical expertise, and usurp the jury's role to weigh the facts and reach legal conclusions and/or the court's role in instructing the jury on the law. *Arista*, 2018 WL 8949299, at *3; *United States v. Poschwatta*, 829 F.2d 1477, 1483 (9th Cir. 1987) ("A witness also may not testify to the legal implications of conduct; the court must be the jury's only source of the law.")

[9] Notably, in his Infringement Report Mr. Credelle even cites case law in support of his opinion that ASUSTeK knew and intended to induce infringement by others. Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶ 156, fn. 44).

2. Mr. Credelle's Opinions Regarding The Comparability Of A Patent License Between ASUSTeK And [redacted] Are Likewise Legal Conclusions

Similarly, Mr. Credelle opines that [redacted] Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶ 115).

Here again, Mr. Credelle's opinions are not based on "scientific, technical or other specialized knowledge [the] will help the trier of fact" under Federal Rule of Evidence 702(a), and they are not "based on sufficient facts or data" as required by Federal Rule of Evidence 702(b). *See Arista Networks*, 2018 WL 8949299, at *2; *see Finjan*, 2015 WL 4272870, at *3. Mr. Credelle's testimony merely vouches for Plaintiff's interpretation of the evidence, thereby usurping the jury's role and function. *See Prime Media Grp.*, 2015 WL 452192, at *7; *Arista*, 2018 WL 8949299, at *3. In fact, Mr. Credelle's opinion that ASUSTeK [redacted] *See* Shaw Decl., Ex. 1 (Credelle Infr. Rep., at ¶¶ 115-126). Accordingly, the court should exclude Mr. Credelle's improper opinions that the patent license agreement between ASUSTeK and [redacted] is not comparable to a hypothetical license between SVV and ASUSTeK.

IV. CONCLUSION

For the reasons explained herein, ASUSTeK respectfully requests an order: (1) excluding the opinions of Mr. Credelle regarding the strength and value of the asserted patents based on the

Innography service, or the presence of objective indicia of non-obviousness, (2) excluding Mr. Credelle's direct infringement opinion based on Section 271(g), (3) excluding the opinions of Mr. Credelle regarding ASUSTeK's knowledge and intent to induce infringement by others, and ASUSTeK's vicarious liability under an alter ego or agency theory, and (4) excluding the opinions of Mr. Credelle regarding the comparability of the patent license agreement between ASUSTeK and [redacted] that are based on facts other than technical comparisons between SVV's patented technology and [redacted] patented technology.

DATED: November 7, 2023

Respectfully submitted

By: */s/ Jack Shaw*

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CERTIFICATE OF CONFERENCE

The undersigned certifies that Counsel for Defendant ASUSTeK Computer Inc. communicated via email with counsel for Plaintiff SVV Technology Innovations, Inc. on November 6, 2023 to confer in good faith concerning the motion. On November 7, 2023, Counsel for Plaintiff responded by indicating that Plaintiff opposes the motion. Accordingly, this motion is submitted.

/s/ Jack Shaw
Jack Shaw

CERTIFICATE OF SERVICE

The undersigned hereby certifies that the foregoing document was filed electronically in compliance with Local Rule CV-5(a) on November 7, 2023, and was served on all counsel via electronic mail.

/s/ Jack Shaw
Jack Shaw

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION

SVV TECHNOLOGY INNOVATIONS, INC., Plaintiff, v. ASUSTeK COMPUTER INC., Defendant.	Civil Action No. 6:22-cv-00311-ADA Civil Action No. 6:22-cv-00312-ADA Civil Action No. 6:22-cv-00313-ADA JURY DEMANDED

DECLARATION OF JACK SHAW IN SUPPORT OF DEFENDANT ASUSTeK COMPUTER INC.'S *DAUBERT* MOTION TO EXCLUDE CERTAIN OPINIONS OF THOMAS L. CREDELLE OR, IN THE ALTERNATIVE, STRIKE PORTIONS OF HIS INFRINGEMENT REPORT

I, Jack Shaw, declare as follows:

1. I am an attorney at the law firm Procopio, Cory, Hargreaves & Savitch LLP and counsel for Defendant ASUSTeK Computer, Inc. ("ASUSTeK") in the above- captioned action. I am a member in good standing of the State Bar of California and have been admitted to practice in the Western District of Texas. I submit this declaration in support of Defendant ASUSTeK Computer Inc.'s *Daubert* Motion to Exclude Certain Opinions of Thomas L. Credelle or, in the Alternative, Strike Portions of His Infringement Report. I have personal knowledge of the facts set forth in this declaration and, if called as a witness, could and would testify competently to such facts under oath.

2. Exhibit 1 is a true and correct copy of relevant excerpts taken from the Opening Expert Report of Thomas L. Credelle Regarding Infringement by ASUSTeK Computer Inc., dated September 12, 2023.

3. Exhibit 2 is a true and correct copy of the Innography Report assigning its PatentStrength Ranking for the following patents: US6261664, US7523373, US7725759, US6970083,

US7268588, US7608597, US7709303, US7896742, US7936370, US7954129, US8208019, US8577813, US8610772, US9072752, US9100826, and US9530137.

4. Exhibit 3 is a true and correct copy of excerpts from the Deposition of Jason Wu.

5. Exhibit 4 is a true and correct copy of *Advanced Display Techs. of Texas v. AU Optronics Corp.*, Case No. 6:11-CV-00011-LED, D.I. 229 (E.D. TX July 12, 2012).

6. Exhibit 5 is a true and correct copy of *Patent Quality Assurance, LLC v. VLSI Tech. LLC*, IPR2021-01229, Paper No. 129 (P.T.A.B. 2023).

7. Exhibit 6 is a true and correct copy of *Intel Corp. v. VLSI Tech. LLC*, IPR2021-01064, Paper No. 135 (P.T.A.B. 2023).

8. Exhibit 7 is a true and correct copy of *Canon Inc. v. Avigilon Fortress Corp.*, IPR2017-01833, Paper No. 31 (P.T.A.B. 2019).

9. Exhibit 8 is a true and correct copy of *Intel Corp. v. VLSI Tech. LLC*, IPR2018-01035, Paper No. 32 (P.T.A.B. 2020).

10. Exhibit 9 is a true and correct copy of *Intel Corp. v. VLSI Tech. LLC*, IPR2018-01105, Paper No. 44 (P.T.A.B. 2019).

11. Exhibit 10 is a true and correct copy of *Sensormatic Elecs., LLC v. Wyze Labs, Inc.*, No. 1:19-cv-01543, D.I. 97 (D. Del. 2020).

12. Exhibit 11 is a true and correct copy of *Universal Secure Registry LLC v. Apple Inc.*, No. 1:17-cv-00585, D.I. 167 (D. Del. 2020).

13. Exhibit 12 is a true and correct copy of *Rimfrost AS. v. Aker Biomarine Antarctic AS.*, IPR2018-01730, Paper No. 35 (P.T.A.B. 2020).

14. Exhibit 13 is a true and correct copy of excerpts from the Deposition of James Lee.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on the 7th day of November 2023, in Palo Alto, California.

By: */s/ Jack Shaw*
Jack Shaw

EXHIBIT 1

[ENTIRELY REDACTED]

EXHIBIT 2

Publication Number	Kind Code	PatentStrength	Title	Assignee	Innography URL	PDF URL	Legal Status	DWPI Title	DWPI Abstract Advantage	DWPI Abstract Novelty	DWPI Abstract Use
US6970083	B2	91	Video tripwire	Avigilon Fortress Corporation	https://patentscout.innography.com/share/3yqoVUL2FrBriCnQTR2Qww%3D%3D	https://patentscout.innography.com/share/3yqoVUL2FrBriCnQTR2Qww%3D%3D/download	2003-10-31-ASSIGNMENT (DIAMONDBACK VISION, INC.)|2003-11-19-ASSIGNMENT (OBJECTVIDEO, INC.)|2005-09-29-ASSIGNMENT (WESTLB AG, LONDON BRANCH, AS SECURITY AGENT)|2005-11-09-INFORMATION ON STATUS: PATENT GRANT|2008-02-08-ASSIGNMENT (RJF OV, LLC)|2008-10-16-ASSIGNMENT (RJF OV, LLC)|2009-04-28-FEE PAYMENT|2009-12-05-FEE PAYMENT PROCEDURE|2010-12-07-FEE PAYMENT PROCEDURE|2010-12-30-ASSIGNMENT (OBJECTVIDEO, INC.)|2012-04-17-REQUEST FOR REEXAMINATION FILED|2013-03-08-FEE PAYMENT|2014-12-17-ASSIGNMENT (AVIGILON FORTRESS CORPORATION)|2015-04-07-ASSIGNMENT (HSBC BANK CANADA)|2017-05-30-FEE PAYMENT|2017-08-29-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2018-08-13-ASSIGNMENT (AVIGILON FORTRESS CORPORATION)	Video tripwire system for surveillance, has user interface with input unit that has graphical user interface which allows user to draw video tripwire on video image or snapshot taken from video output	The tripwire system detects arbitrary moving objects without the need of any external equipment e.g. card reader and keypad, thereby making easier installation and implementation.	The system has a computer system with a user interface for performing calibration, for processing data based on video output received from a sensing device and for displaying data. The interface has an output unit and an input unit that has a graphical user interface. The graphical interface allows a user to draw a video tripwire on a video image or a snapshot taken from a video output.	Used in bank and stores for the surveillance of object such as humans, vehicle, animal, plant growth, falling object and microscopic entity.
US7268588	B2	92	Cascadable level shifter cell	Vlsi Technology LLC	https://patentscout.innography.com/share/eoVmQ5c2q9eNqe6Maq3fxw%3D%3D	https://patentscout.innography.com/share/eoVmQ5c2q9eNqe6Maq3fxw%3D%3D/download	2005-06-28-ASSIGNMENT (FREESCALE SEMICONDUCTOR, INC.)|2006-12-01-ASSIGNMENT (CITIBANK, N.A. AS COLLATERAL AGENT)|2006-12-08-FEE PAYMENT PROCEDURE|2007-08-22-INFORMATION ON STATUS: PATENT GRANT|2007-10-25-ASSIGNMENT (CITIBANK, N.A.)|2007-12-04-CERTIFICATE OF CORRECTION|2010-04-13-ASSIGNMENT (CITIBANK, N.A., AS COLLATERAL AGENT)|2011-02-18-FEE PAYMENT|2013-05-21-ASSIGNMENT (CITIBANK, N.A., AS NOTES COLLATERAL AGENT)|2013-11-01-ASSIGNMENT (CITIBANK, N.A., AS NOTES COLLATERAL AGENT)|2015-03-11-FEE PAYMENT|2015-12-07-ASSIGNMENT (FREESCALE SEMICONDUCTOR, INC.)|2015-12-07-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2015-12-07-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2015-12-07-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2015-12-07-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-02-18-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-02-18-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-02-18-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-02-18-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-02-18-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-02-18-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-02-18-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-02-18-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-05-25-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-06-22-ASSIGNMENT (NXP B.V.)|2016-06-22-ASSIGNMENT (NXP B.V.)|2016-07-12-ASSIGNMENT (NXP B.V.)|2016-08-16-ASSIGNMENT (VLSI TECHNOLOGY LLC)|2016-08-16-ASSIGNMENT (VLSI TECHNOLOGY LLC)|2016-09-12-ASSIGNMENT (NXP, B.V., F/K/A FREESCALE SEMICONDUCTOR, INC.)|2016-09-12-ASSIGNMENT (NXP, B.V. F/K/A FREESCALE SEMICONDUCTOR, INC.)|2017-05-02-ASSIGNMENT (NXP USA, INC. F/K/A FREESCALE SEMICONDUCTOR, INC.)|2018-09-04-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2019-02-17-ASSIGNMENT (SHENZHEN XINGUODU TECHNOLOGY CO., LTD.)|2019-03-11-MAINTENANCE FEE PAYMENT|2019-09-03-ASSIGNMENT (NXP B.V.)|2021-08-24-TRIAL AND APPEAL BOARD: INTER PARTES REVIEW CERTIFICATE	Voltage level shifter circuit, has protection layer coupling two nodes to third and fourth nodes via respective isolation paths that keep initial two nodes within voltage range and to keep third and fourth nodes within another range	The circuit operates between lower level chip voltages and higher voltage peripheral components and circuits, thus providing noise immunity.	The circuit has an upper input circuit (402) receiving an input signal and switches two nodes to opposite states within a voltage range between supply voltages. A protection layer (404) couples two nodes to third and fourth nodes via respective isolation paths. The paths operate to keep the initial two nodes within a voltage range and to keep the third and fourth nodes within another voltage range. A lower input circuit (406) switches the third and fourth nodes to opposite states within the latter voltage range between third and fourth supply voltages in response to switching of the nodes.	Voltage level shifter circuit.
US7608597	B2	92	Methods and compositions for treating hepatitis c virus	Idenix Pharmaceuticals LLC	https://patentscout.innography.com/share/iWxp0gPNozS6soAsnII3cg%3D%3D	https://patentscout.innography.com/share/iWxp0gPNozS6soAsnII3cg%3D%3D/download	2009-10-07-INFORMATION ON STATUS: PATENT GRANT|2013-03-07-FEE PAYMENT|2015-04-27-ASSIGNMENT (IDENIX PHARMACEUTICALS LLC)|2017-03-27-FEE PAYMENT|2021-03-11-MAINTENANCE FEE PAYMENT	New 1'-, 2'- and 3'-modified nucleoside compounds, useful in the treatment and prophylaxis of hepatitis C viral infections		Modified nucleoside compounds (I)-(XVIII) are new.	(I)-(XVIII) are useful for the treatment and prophylaxis of Hepatitis C viral infections (claimed).

<table>
<tr><td>US7709303</td><td>B2</td><td>92</td><td>Process for forming an electronic device including a fin-type structure</td><td>Vlsi Technology LLC</td><td>https://patentscout.innography.com/share/9U6mzw0lZ5_gmH5ioqI0Cw%3D%3D</td><td>https://patentscout.innography.com/share/9U6mzw0lZ5_gmH5ioqI0Cw%3D%3D/download</td><td>2006-01-10-ASSIGNMENT (FREESCALE SEMICONDUCTOR, INC.)|2006-12-01-ASSIGNMENT (CITIBANK, N.A. AS COLLATERAL AGENT)|2010-02-19-ASSIGNMENT (CITIBANK, N.A.)|2010-04-13-ASSIGNMENT (CITIBANK, N.A., AS COLLATERAL AGENT)|2010-04-14-INFORMATION ON STATUS: PATENT GRANT|2010-12-02-FEE PAYMENT PROCEDURE|2013-05-21-ASSIGNMENT (CITIBANK, N.A., AS NOTES COLLATERAL AGENT)|2013-11-01-ASSIGNMENT (CITIBANK, N.A., AS NOTES COLLATERAL AGENT)|2013-11-04-FEE PAYMENT|2015-12-07-ASSIGNMENT (FREESCALE SEMICONDUCTOR, INC.)|2015-12-07-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2015-12-07-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2015-12-07-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2015-12-07-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-02-18-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-02-18-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-02-18-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-02-18-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-02-18-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-02-18-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-02-18-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-02-18-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-05-25-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-06-22-ASSIGNMENT (NXP B.V.)|2016-06-22-ASSIGNMENT (NXP B.V.)|2016-07-12-ASSIGNMENT (NXP B.V.)|2016-08-16-ASSIGNMENT (VLSI TECHNOLOGY LLC)|2016-08-16-ASSIGNMENT (VLSI TECHNOLOGY LLC)|2016-09-12-ASSIGNMENT (NXP, B.V., F/K/A FREESCALE SEMICONDUCTOR, INC.)|2016-09-12-ASSIGNMENT (NXP, B.V. F/K/A FREESCALE SEMICONDUCTOR, INC.)|2017-05-02-ASSIGNMENT (NXP USA, INC. F/K/A FREESCALE SEMICONDUCTOR, INC.)|2017-11-02-MAINTENANCE FEE PAYMENT|2018-07-03-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2019-02-17-ASSIGNMENT (SHENZHEN XINGUODU TECHNOLOGY CO., LTD.)|2019-09-03-ASSIGNMENT (NXP B.V.)|2020-01-31-INFORMATION ON STATUS: APPEAL PROCEDURE|2021-08-24-TRIAL AND APPEAL BOARD: INTER PARTES REVIEW CERTIFICATE|2021-12-20-FEE PAYMENT PROCEDURE</td><td>Electronic device formation by forming first semiconductor fin (having first height) for first fin-type transistor structure, and removing portion of first semiconductor fin to provide fin with second height i.e. smaller than first height</td><td>The FinFETs have a greater range of available channel widths.</td><td>Electronic device formation comprises forming a first semiconductor fin (having a first height) for a first fin-type transistor structure; and removing a portion of the first semiconductor fin to provide the first semiconductor fin with a second height, which is smaller than the first height. Forming the first semiconductor fin includes forming the first semiconductor fin from a semiconductor material with a (110) crystal plane for a fin sidewall.</td><td>For forming an electronic device e.g. Fin field effect transistor (FET) static RAM cell.</td></tr>
<tr><td>US7896742</td><td>B2</td><td>91</td><td>Apparatus and methods for providing interactive entertainment</td><td>Mq Gaming, LLC</td><td>https://patentscout.innography.com/share/MntzNwQaU1rUQRdxEFNu7A%3D%3D</td><td>https://patentscout.innography.com/share/MntzNwQaU1rUQRdxEFNu7A%3D%3D/download</td><td>2006-02-28-ASSIGNMENT (CREATIVE KINGDOMS, LLC)|2011-02-09-INFORMATION ON STATUS: PATENT GRANT|2013-08-06-ASSIGNMENT (DEUTSCHE BANK AG NEW YORK BRANCH)|2014-08-29-FEE PAYMENT|2015-02-13-ASSIGNMENT (CREATIVE KINGDOMS, LLC;GREAT WOLF RESORTS HOLDINGS, INC. (F/K/A GREAT WOLF RESORTS, INC.))|2015-05-05-ASSIGNMENT (MQ GAMING, LLC)|2018-10-22-FEE PAYMENT PROCEDURE|2019-04-08-LAPSE FOR FAILURE TO PAY MAINTENANCE FEES|2019-04-08-INFORMATION ON STATUS: PATENT DISCONTINUATION|2019-04-30-EXPIRED DUE TO FAILURE TO PAY MAINTENANCE FEE</td><td>Toy wand for use in interactive play environment, has transmitter for wireless communication, sensor circuitry coupled to elongated body, and sensor circuitry generating signal in response to particular motions of elongated body</td><td>The wand provides exciting and entertaining games and toys that increase learning and entertainment opportunities for children and stimulate creativity and imagination.</td><td>The wand has a transmitter provided for a wireless communication, and a sensor circuitry coupled to an elongated body. The sensor circuitry is provided for generating a signal in response to particular motions of the elongated body. An actuation circuitry is coupled to the sensor circuitry, and is provided for causing a transmitter to wirelessly send one of different command signals for controlling the effects in responsive to the signal. A proximal end (112) of a tube is adapted to secure the tube to an optional handle.</td><td>Toy wand for use in an interactive play environment.</td></tr>
<tr><td>US7936370</td><td>B2</td><td>94</td><td>Wireless video surveillance system and method with dual encoding</td><td>Sensormatic Electronics, LLC</td><td>https://patentscout.innography.com/share/Fz6rmigUzsDycqTjhO_uYw%3D%3D</td><td>https://patentscout.innography.com/share/Fz6rmigUzsDycqTjhO_uYw%3D%3D/download</td><td>2005-04-01-ASSIGNMENT (GRAHAM, TOMMY;HEIDTKE, L.O.;ANURAG NIGAM REVOCABLE TRUST 2000;PIGSKIN PARTNERS, LLC;WBR FAMILY LIMITED PARTNERSHIP;MURPHY, DAVID;BIG BASIN PARTNERS LP;PECKHAM, JACK L.;JBS & ASSOCIATES OF SUFFOLK, INC.)|2005-04-01-ASSIGNMENT (GRAHAM, TOMMY;HEIDTKE, L.O.;ANURAG NIGAM RECOVABLE TRUST 2000;PIGSKIN PARTNERS, LLC;WBR FAMILY LIMITED PARTNERSHIP;MURPHY, DAVID;BIG BASIN PARTNERS LP;PECKHAM, JACK L.;JBS & ASSOCIATES OF SUFFOLK, INC.)|2006-10-10-ASSIGNMENT (SMARTVUE CORPORATION)|2011-04-13-INFORMATION ON STATUS: PATENT GRANT|2013-10-31-ASSIGNMENT (SMARTVUE CORPORATION)|2014-11-03-FEE PAYMENT|2014-11-24-ASSIGNMENT (ELLIS COMMUNICATIONS, INC., AS COLLATERAL AGENT;KNOLL VENTURES LLC, AS COLLATERAL AGENT)|2015-04-17-ASSIGNMENT (FORTRESS CREDIT CO LLC)|2015-04-17-ASSIGNMENT (KIP SMRT P1 LP)|2015-04-17-ASSIGNMENT (FORTRESS CREDIT CO LLC)|2017-10-19-FEE PAYMENT PROCEDURE|2018-03-30-ASSIGNMENT (SENSORMATIC ELECTRONICS, LLC)|2018-11-05-MAINTENANCE FEE PAYMENT|2020-11-03-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2022-10-25-MAINTENANCE FEE PAYMENT</td><td>Dual encoding method for video surveillance system, involves encoding inputs from input capture device into dual formats for remote access by user at remote viewing device</td><td>Eliminates user maintenance, upgrading hence optimizes system performance. Reduces costs and permits low band multi-input capture device (ICD) viewing by the system user.</td><td>The inputs captured by input capture device (ICD) (30) is transmitted to the digital input recorder (DIR) (10), and encoded to provide dual formats. The dual encoded inputs are remotely accessed by the user at remote viewing device through user interface.</td><td>For dual encoding of inputs from input capture device (ICD) of wireless video surveillance system (claimed).</td></tr>
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US7954129	B2	92	Wireless video surveillance system and method with remote viewing	Sensormatic Electronics, LLC	https://patentscout.innography.com/share/euZ4oNvEPrOoCaRywwK6fQ%3D%3D	https://patentscout.innography.com/share/euZ4oNvEPrOoCaRywwK6fQ%3D%3D/download	2005-04-01-ASSIGNMENT (GRAHAM, TOMMY;HEIDTKE, L.O.;ANURAG NIGAM REVOCABLE TRUST 2000;PIGSKIN PARTNERS, LLC;WBR FAMILY LIMITED PARTNERSHIP;MURPHY, DAVID;BIG BASIN PARTNERS LP;PECKHAM, JACK L.;JBS & ASSOCIATES OF SUFFOLK, INC.)|2005-04-01-ASSIGNMENT (GRAHAM, TOMMY;HEIDTKE, L.O.;ANURAG NIGAM RECOVABLE TRUST 2000;PIGSKIN PARTNERS, LLC;WBR FAMILY LIMITED PARTNERSHIP;MURPHY, DAVID;BIG BASIN PARTNERS LP;PECKHAM, JACK L.;JBS & ASSOCIATES OF SUFFOLK, INC.)|2006-10-10-ASSIGNMENT (SMARTVUE CORPORATION)|2011-05-11-INFORMATION ON STATUS: PATENT GRANT|2013-10-31-ASSIGNMENT (SMARTVUE CORPORATION)|2014-11-03-FEE PAYMENT|2014-11-24-ASSIGNMENT (ELLIS COMMUNICATIONS, INC., AS COLLATERAL AGENT;KNOLL VENTURES LLC, AS COLLATERAL AGENT)|2015-04-17-ASSIGNMENT (FORTRESS CREDIT CO LLC)|2015-04-17-ASSIGNMENT (KIP SMRT P1 LP)|2015-04-17-ASSIGNMENT (FORTRESS CREDIT CO LLC)|2017-10-19-FEE PAYMENT PROCEDURE|2018-03-30-ASSIGNMENT (SENSORMATIC ELECTRONICS, LLC)|2018-11-30-MAINTENANCE FEE PAYMENT|2020-11-03-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2023-01-16-FEE PAYMENT PROCEDURE|2023-07-03-INFORMATION ON STATUS: PATENT DISCONTINUATION|2023-07-03-LAPSE FOR FAILURE TO PAY MAINTENANCE FEES|2023-07-25-LAPSED DUE TO FAILURE TO PAY MAINTENANCE FEE	Method for remote viewing of inputs in wireless video surveillance system, involves enabling user to access still images stored in digital input recorder, on receiving access request after authentication	Provides secure surveillance system of target environment.	The method involves storing the still images of target environment acquired by an input capture device (ICD), in a digital input recorder (DIR). The user is enabled to access the digital input recorder on receiving access request, after authentication.	For remote viewing of captured still image of target environment in wireless video surveillance system (claimed) using remote controller computer, cellular phone and other internet connected device.
US8208019	B2	93	Wireless video surveillance system and method with external removable recording	Sensormatic Electronics, LLC	https://patentscout.innography.com/share/OkbjUI0b1GRJG0KivD5aEQ%3D%3D	https://patentscout.innography.com/share/OkbjUI0b1GRJG0KivD5aEQ%3D%3D/download	2005-04-01-ASSIGNMENT (GRAHAM, TOMMY;HEIDTKE, L.O.;ANURAG NIGAM REVOCABLE TRUST 2000;PIGSKIN PARTNERS, LLC;WBR FAMILY LIMITED PARTNERSHIP;MURPHY, DAVID;BIG BASIN PARTNERS LP;PECKHAM, JACK L.;JBS & ASSOCIATES OF SUFFOLK, INC.)|2005-04-01-ASSIGNMENT (GRAHAM, TOMMY;HEIDTKE, L.O.;ANURAG NIGAM RECOVABLE TRUST 2000;PIGSKIN PARTNERS, LLC;WBR FAMILY LIMITED PARTNERSHIP;MURPHY, DAVID;BIG BASIN PARTNERS LP;PECKHAM, JACK L.;JBS & ASSOCIATES OF SUFFOLK, INC.)|2006-10-10-ASSIGNMENT (SMARTVUE CORPORATION)|2012-06-06-INFORMATION ON STATUS: PATENT GRANT|2013-10-31-ASSIGNMENT (SMARTVUE CORPORATION)|2014-11-24-ASSIGNMENT (ELLIS COMMUNICATIONS, INC., AS COLLATERAL AGENT;KNOLL VENTURES LLC, AS COLLATERAL AGENT)|2015-04-17-ASSIGNMENT (FORTRESS CREDIT CO LLC)|2015-04-17-ASSIGNMENT (KIP SMRT P1 LP)|2015-04-17-ASSIGNMENT (FORTRESS CREDIT CO LLC)|2016-02-05-MAINTENANCE FEE REMINDER MAILED|2016-02-25-SURCHARGE FOR LATE PAYMENT|2016-02-25-FEE PAYMENT|2017-10-19-FEE PAYMENT PROCEDURE|2018-03-30-ASSIGNMENT (SENSORMATIC ELECTRONICS, LLC)|2019-12-26-MAINTENANCE FEE PAYMENT|2020-11-03-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW	Acquisition method of data from wireless video surveillance system, involves transferring data associated with inputs captured by input capture device, to external removable data storage device	Permits variety of data management functions including quick and easy transfer of specific video and/or images, data backup and transfer of data to third party such as an emergency service provider like police and insurance companies.	The data associated with the inputs that are captured by input capture device (ICD) (30) in response to occurrence of a trigger event, is transferred to an external removable data storage device connected to the digital input recorder (DIR) (10) and ICD.	For acquiring data from wireless video surveillance system (claimed) for monitoring target environment.
US8325044	B2	76	System and method for providing secure identification solutions	Neology, Inc.	https://patentscout.innography.com/share/B4vb703W6LZ8ghSa-7eXrg%3D%3D	https://patentscout.innography.com/share/B4vb703W6LZ8ghSa-7eXrg%3D%3D/download	2003-09-25-ASSIGNMENT (BNC IP SWITZERLAND GMBH)|2005-03-30-ASSIGNMENT (NEOLOGY, INC.)|2012-11-14-INFORMATION ON STATUS: PATENT GRANT|2014-06-24-CERTIFICATE OF CORRECTION|2015-04-07-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2015-04-07-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2016-06-06-FEE PAYMENT|2016-11-15-INFORMATION ON STATUS: APPEAL PROCEDURE|2020-05-28-MAINTENANCE FEE PAYMENT	Radio frequency identification system for registered item e.g. vehicle, has identification device that contains integrated computer chip and antenna for contactless communication at predetermined operating frequency	The system offers secure and durable identification mechanism resistant to fraud and counterfeiting. The RF device allows electronic identification via the reading of the data stored in the chip, when the device is operated in a contactless mode. The device is manufactured with light diffraction and high security print features that eliminate document forgery and enables instant visual verification of authenticity.	The system has a radio frequency (RF) identification device (110) that contains an integrated computer chip (115) and RF antenna (120) for contactless communication at an operating frequency of 13.56 megahertz. The antenna is embedded on the chip, and a RF identification mechanism (105) e.g. a card or sticker (105) incorporates the device. A RF reader/writer (125) reads information from the device.	Used for verifying identification information regarding a registered item e.g. vehicle.

US8577813	B2	92	Universal secure registry	Universal Secure Registry, LLC	https://patentscout.innography.com/share/K3IIG47COlT9gwZtJXxoeQ%3D%3D	https://patentscout.innography.com/share/K3IIG47COlT9gwZtJXxoeQ%3D%3D/download	2011-08-19-ASSIGNMENT (UNIVERSAL SECURE REGISTRY, LLC)|2013-10-16-INFORMATION ON STATUS: PATENT GRANT|2016-07-22-ASSIGNMENT (KW STRATEGIC ENTERPRISES, LLC)|2016-12-13-ASSIGNMENT (UNIVERSAL SECURE REGISTRY, LLC)|2017-05-05-FEE PAYMENT|2017-11-28-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2018-06-26-AIA TRIAL PROCEEDING FILED BEFORE PATENT TRIAL AND APPEAL BOARD: COVERED BUSINESS METHODS|2018-07-03-AIA TRIAL PROCEEDING FILED BEFORE PATENT TRIAL AND APPEAL BOARD: COVERED BUSINESS METHODS|2018-07-10-AIA TRIAL PROCEEDING FILED BEFORE PATENT TRIAL AND APPEAL BOARD: COVERED BUSINESS METHODS|2019-02-12-AIA TRIAL PROCEEDING FILED BEFORE PATENT TRIAL AND APPEAL BOARD: COVERED BUSINESS METHODS|2019-02-12-AIA TRIAL PROCEEDING FILED BEFORE PATENT TRIAL AND APPEAL BOARD: COVERED BUSINESS METHODS|2019-07-03-INFORMATION ON STATUS: APPEAL PROCEDURE|2020-01-21-INFORMATION ON STATUS: APPEAL PROCEDURE|2021-04-20-TRIAL AND APPEAL BOARD: INTER PARTES REVIEW CERTIFICATE|2021-05-05-MAINTENANCE FEE PAYMENT	Device for authenticating/verifying identity in financial transaction, e.g. handheld computers, generates encrypted authentication information from non-predictable value, identifying information, information concerning biometric input	The information about individual can be provided efficiently to the authorized users. The individual can be identified accurately without compromising security. The user identity can be confirmed or verified without providing any identifying information about the person to the entity requiring identification.	The device has a biometric sensor configured to receive a biometric input. A user interface (26) is configured to receive secret information known to the user and identifying information concerning an account selected by the user from several accounts. The processor is configured to generate encrypted authentication information from the non-predictable value, the identifying information, the information concerning the biometric input and the secret information. The encrypted authentication information is communicated through a communication link to the universal secure registry (24).	Device for authenticating/verifying identity of individuals in financial transaction, e.g. handheld computer, desktop computer, and laptop computer.
US8587436	B2	89	System and method for providing secure identification solutions	Neology, Inc.	https://patentscout.innography.com/share/IlFNyQHrtarJDVQRKP1HRw%3D%3D	https://patentscout.innography.com/share/IlFNyQHrtarJDVQRKP1HRw%3D%3D/download	2003-09-25-ASSIGNMENT (BNC IP SWITZERLAND GMBH)|2005-03-30-ASSIGNMENT (NEOLOGY, INC.)|2013-10-30-INFORMATION ON STATUS: PATENT GRANT|2014-04-29-CERTIFICATE OF CORRECTION|2015-04-14-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2015-04-14-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2017-05-19-FEE PAYMENT|2021-05-05-MAINTENANCE FEE PAYMENT	Radio frequency identification system for registered item e.g. vehicle, has identification device that contains integrated computer chip and antenna for contactless communication at predetermined operating frequency	The system offers secure and durable identification mechanism resistant to fraud and counterfeiting. The RF device allows electronic identification via the reading of the data stored in the chip, when the device is operated in a contactless mode. The device is manufactured with light diffraction and high security print features that eliminate document forgery and enables instant visual verification of authenticity.	The system has a radio frequency (RF) identification device (110) that contains an integrated computer chip (115) and RF antenna (120) for contactless communication at an operating frequency of 13.56 megahertz. The antenna is embedded on the chip, and a RF identification mechanism (105) e.g. a card or sticker (105) incorporates the device. A RF reader/writer (125) reads information from the device.	Used for verifying identification information regarding a registered item e.g. vehicle.
US8610772	B2	92	Wireless video surveillance system and method with input capture and data transmission prioritization and adjustment	Sensormatic Electronics, LLC	https://patentscout.innography.com/share/lPTFcnyP2A_l6Ax51MkQ6g%3D%3D	https://patentscout.innography.com/share/lPTFcnyP2A_l6Ax51MkQ6g%3D%3D/download	2006-10-10-ASSIGNMENT (SMARTVUE CORPORATION)|2013-11-26-INFORMATION ON STATUS: PATENT GRANT|2014-11-24-ASSIGNMENT (ELLIS COMMUNICATIONS, INC., AS COLLATERAL AGENT;KNOLL VENTURES LLC, AS COLLATERAL AGENT)|2015-04-17-ASSIGNMENT (FORTRESS CREDIT CO LLC)|2015-04-17-ASSIGNMENT (KIP SMRT P1 LP)|2015-04-17-ASSIGNMENT (FORTRESS CREDIT CO LLC)|2017-07-28-MAINTENANCE FEE REMINDER MAILED|2017-08-15-DISCLAIMER FILED|2017-10-10-MAINTENANCE FEE PAYMENT|2017-10-10-FEE PAYMENT PROCEDURE|2017-10-19-FEE PAYMENT PROCEDURE|2018-03-30-ASSIGNMENT (SENSORMATIC ELECTRONICS, LLC)|2018-07-09-MAINTENANCE FEE PAYMENT|2018-07-09-FEE PAYMENT PROCEDURE|2020-11-03-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2021-06-17-MAINTENANCE FEE PAYMENT	Networked surveillance system i.e. wireless video surveillance system, for surveillance of environment in indoor application, has input capture device and digital recorder that are set up and activated with single click-select command	The surveillance system provides input capture and data transmission prioritization, thus providing a secure surveillance system having wireless communication for monitoring a target environment with prioritization capabilities. The system provides simple set up and controls for high quality input capture by the surveillance input capture devices and prioritization including video inputs, and digital input recorder device (DIR) associated with the ICDs, the DIRs data transfer, storage, and control.	The system has a base system comprising a wireless input capture device (ICD) and a corresponding digital input recorder (DIR) or another ICD. The ICDs adjust ICD settings and controls without coupling through a remote server computer. The ICDs and DIR are set up and activated with a single click-select command for providing an automatically networked surveillance system following the single click-select command activation. The ICDs auto-adjust bandwidth to the DIR after the single click-select command activation in a base system.	Networked surveillance system i.e. wireless video surveillance system, for surveillance of predetermined environment. Uses include but are not limited to indoor applications, waterproofing and weather-proofing housing units for sealing housing against water and weather for outdoor applications, sealed or gasketed casing and weatherproof venting application.

US9072752	B1	88	Bioeffective krill oil compositions	Aker Biomarine Antarctic As	https://patentscout.innography.com/share/5EBkEwdJX5DofAaQrt9WZg%3D%3D	https://patentscout.innography.com/share/5EBkEwdJX5DofAaQrt9WZg%3D%3D/download	2015-02-17-ASSIGNMENT (AKER BIOMARINE ANTARCTIC AS)|2015-06-17-INFORMATION ON STATUS: PATENT GRANT|2018-10-23-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2019-01-07-MAINTENANCE FEE PAYMENT|2021-06-15-TRIAL AND APPEAL BOARD: INTER PARTES REVIEW CERTIFICATE|2023-02-27-FEE PAYMENT PROCEDURE|2023-08-14-LAPSE FOR FAILURE TO PAY MAINTENANCE FEES|2023-08-14-INFORMATION ON STATUS: PATENT DISCONTINUATION|2023-09-05-LAPSED DUE TO FAILURE TO PAY MAINTENANCE FEE	Composition useful as krill oil composition e.g. capsule and dietary supplement for treating diet-induced hyperinsulinemia, insulin insensitivity, fatty liver and inflammation, comprises ether phospholipid and astaxanthin		A composition comprises ether phospholipid (3-10 weight/weight%) and astaxanthin (400-2500 mg/kg).	The composition is useful as krill oil composition is in the form of capsule and dietary supplement for preventing or treating diet-induced hyperinsulinemia, insulin insensitivity, muscle mass hypertrophy, serum adiponectin reduction or hepatic steatosis, fatty heart, fatty liver, insulin resistance, inflammation, blood lipid profile and oxidative stress, for inducing diuresis, increasing muscle mass and decreasing protein catabolism. The krill meal composition is useful to increase flesh coloration in an aquatic species and increase growth and overall survival rate of aquatic species (all claimed).
US9100826	B2	91	Method and apparatus for secure access payment and identification	Universal Secure Registry, LLC	https://patentscout.innography.com/share/gdK5ohnUDdSdc7xm91bUHw%3D%3D	https://patentscout.innography.com/share/gdK5ohnUDdSdc7xm91bUHw%3D%3D/download	2011-08-19-ASSIGNMENT (UNIVERSAL SECURE REGISTRY, LLC)|2015-07-15-INFORMATION ON STATUS: PATENT GRANT|2016-07-22-ASSIGNMENT (KW STRATEGIC ENTERPRISES, LLC)|2016-12-13-ASSIGNMENT (UNIVERSAL SECURE REGISTRY, LLC)|2018-05-08-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2018-05-08-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2019-01-08-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2019-01-08-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2019-02-04-MAINTENANCE FEE PAYMENT|2019-12-10-INFORMATION ON STATUS: APPEAL PROCEDURE|2023-03-27-FEE PAYMENT PROCEDURE|2023-09-11-LAPSE FOR FAILURE TO PAY MAINTENANCE FEES|2023-09-11-INFORMATION ON STATUS: PATENT DISCONTINUATION	System for authenticating identity of user using hand-held device e.g. cell phone, has processor that receives authentication information to authenticate identity of user of handheld device with other device	The person can be accurately identified. The transaction can be authorized to allow the user to access to the secure area. The necessary information can be dynamically generated with high security. The entity access to the secure computer network can be denied, when the authentication information of the user is not corresponded to any of the user.	The system (2100) has a processor (2116) that determines the authentication information derived from the biometric information and to transmit the authentication information of user of handheld device to other device through a network. The processor (2122) is receives the authentication information of the user of the handheld device. The other authentication information of the user of handheld device is retrieved or received. Both the authentication information is received to authenticate the identity of the user of the handheld device with the other device.	Universal secure registry (USR) system for authenticating identity of user using hand-held device such as cell phone, pager, identification card (ID) badge, wrist watch, computer, personal digital assistant and key fob.
US9530137	B2	91	Method and apparatus for secure access payment and identification	Universal Secure Registry, LLC	https://patentscout.innography.com/share/-N4e18G1oPVZuRLXTQZorg%3D%3D	https://patentscout.innography.com/share/-N4e18G1oPVZuRLXTQZorg%3D%3D/download	2016-07-22-ASSIGNMENT (KW STRATEGIC ENTERPRISES, LLC)|2016-12-07-INFORMATION ON STATUS: PATENT GRANT|2016-12-13-ASSIGNMENT (UNIVERSAL SECURE REGISTRY, LLC)|2018-05-08-AIA TRIAL PROCEEDING FILED BEFORE PATENT TRIAL AND APPEAL BOARD: COVERED BUSINESS METHODS|2018-05-08-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2018-05-08-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2019-01-01-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2019-12-09-INFORMATION ON STATUS: APPEAL PROCEDURE|2020-06-29-MAINTENANCE FEE PAYMENT|2021-08-17-DISCLAIMER FILED|2021-09-28-TRIAL AND APPEAL BOARD: INTER PARTES REVIEW CERTIFICATE|2022-08-30-DISCLAIMER FILED	System for authenticating user for enabling transaction, has second processor which is configured to use portion of first authentication information with proof of biometric authentication to complete processing of transaction	The identification system enables a person to be accurately identified and/or authenticated without compromising security, so as to gain access to secure systems and/or areas. The sender enables to send mail by entering a code instead of an address enables the post office to effectively deliver the coded mail to the corresponding address regardless of the frequency with which the address changes or the duration in which the address will remain valid.	The system has a wireless receiver (140) that is configured to retrieve biometric information associated with the user of the first handheld device from stored biometric information of multiple first users stored in a second memory of the wireless receiver. A second processor is also configured to use a portion of the first authentication information with the proof of biometric authentication to complete processing of the transaction. The processing of the transaction includes authentication of an identity of the user of the first handheld device to enable the transaction.	System for authenticating user for enabling transaction used in banking networks, security system.

<table>
<tr><th>Publication Number</th><th>Kind Code</th><th>PatentStrength</th><th>Title</th><th>Assignee</th><th>Innography URL</th><th>PDF URL</th><th>Legal Status</th><th>DWPI Title</th><th>DWPI Abstract Advantage</th><th>DWPI Abstract Novelty</th><th>DWPI Abstract Use</th></tr>
<tr><td>US6261664</td><td>B1</td><td>82</td><td>Optical structures for diffusing light</td><td>Advanced Display Technologies Of Texas, LLC</td><td>https://patentscout.innography.com/share/9mpd-o5sb3fW6jJlmhDwbQ%3D%3D</td><td>https://patentscout.innography.com/share/9mpd-o5sb3fW6jJlmhDwbQ%3D%3D/download</td><td>1999-12-01-ASSIGNMENT (HONEYWELL INTERNATIONAL INC.)|2001-12-02-FEE PAYMENT PROCEDURE|2003-11-02-FEE PAYMENT PROCEDURE|2003-11-02-FEE PAYMENT PROCEDURE|2004-12-27-FEE PAYMENT|2008-12-19-FEE PAYMENT|2010-11-22-ASSIGNMENT (ADVANCED DISPLAY TECHNOLOGIES OF TEXAS, LLC)|2013-02-25-MAINTENANCE FEE REMINDER MAILED|2013-07-17-LAPSE FOR FAILURE TO PAY MAINTENANCE FEES|2013-08-12-INFORMATION ON STATUS: PATENT DISCONTINUATION|2013-09-03-EXPIRED DUE TO FAILURE TO PAY MAINTENANCE FEE|2013-09-03-LAPSED DUE TO FAILURE TO PAY MAINTENANCE FEE</td><td>Optical light diffusing structure Is made by directing collimated light through transparent substrate onto layer of photo-polymerisable material</td><td>Structure has a thin profile with wide optical scattering power when embedded in other materials, and has low optical backscatter and thus higher optical efficiency than conventional diffusers.</td><td>Structure is made by directing collimated or nearly-collimated light through a transparent or translucent substrate and into a layer of photopolymerisable material for a time sufficient to polymerise only part of the material. The polymerised material is combined with an array of tapered optical waveguides, each having an input surface admitting light, a smaller output surface and sidewalls for total reflection of the rays received by the input surface. The unphotopolymerised part of the material is removed and a metallic layer is formed on the photopolymerised material to form a conforming replica layer. The metallic layer is then applied to an embossable material.</td><td>Structure is for refracting or scattering light or is for use as a bulk diffuser with flat surfaces and embedded light-scattering elements, used e.g. between the output polariser and outer hardcoat layers of an LCD system to protect the diffuser from damage.</td></tr>
<tr><td>US7523373</td><td>B2</td><td>90</td><td>Minimum memory operating voltage technique</td><td>Vlsi Technology LLC</td><td>https://patentscout.innography.com/share/R8URt8RJAWU9kaz-qCJDUg%3D%3D</td><td>https://patentscout.innography.com/share/R8URt8RJAWU9kaz-qCJDUg%3D%3D/download</td><td>2006-08-24-ASSIGNMENT (FREESCALE SEMICONDUCTOR, INC.)|2006-12-01-ASSIGNMENT (CITIBANK, N.A. AS COLLATERAL AGENT)|2009-04-01-INFORMATION ON STATUS: PATENT GRANT|2009-08-04-ASSIGNMENT (CITIBANK, N.A.)|2010-04-13-ASSIGNMENT (CITIBANK, N.A., AS COLLATERAL AGENT)|2012-10-22-FEE PAYMENT|2013-05-21-ASSIGNMENT (CITIBANK, N.A., AS NOTES COLLATERAL AGENT)|2013-11-01-ASSIGNMENT (CITIBANK, N.A., AS NOTES COLLATERAL AGENT)|2015-12-07-ASSIGNMENT (FREESCALE SEMICONDUCTOR, INC.)|2015-12-07-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2015-12-07-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2015-12-07-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2015-12-07-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-05-25-ASSIGNMENT (MORGAN STANLEY SENIOR FUNDING, INC.)|2016-06-22-ASSIGNMENT (NXP B.V.)|2016-06-22-ASSIGNMENT (NXP B.V.)|2016-08-31-FEE PAYMENT|2016-09-12-ASSIGNMENT (NXP, B.V., F/K/A FREESCALE SEMICONDUCTOR, INC.)|2016-09-12-ASSIGNMENT (NXP, B.V. F/K/A FREESCALE SEMICONDUCTOR, INC.)|2016-11-07-ASSIGNMENT (NXP USA, INC.)|2016-11-07-ASSIGNMENT (NXP USA, INC.)|2019-02-01-ASSIGNMENT (VLSI TECHNOLOGY LLC)|2019-02-11-ASSIGNMENT (NXP B.V.)|2019-02-17-ASSIGNMENT (SHENZHEN XINGUODU TECHNOLOGY CO., LTD.)|2019-09-03-ASSIGNMENT (NXP B.V.)|2019-12-17-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2020-10-15-MAINTENANCE FEE PAYMENT|2021-07-20-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2021-08-17-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2022-03-15-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2022-03-29-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW</td><td>Minimum operating voltage e.g. minimum read voltage, determining method for e.g. dynamic RAM, involves determining value of minimum operating voltage of memory, and storing value in non-volatile memory location</td><td>The minimum operating voltage of the memory is determined and stored in the non-volatile register, thus operating the integrated circuit (IC) at its lowest voltage, and hence reducing power consumption of the IC.</td><td>The method involves providing an integrated circuit (IC) with a memory (18) e.g. dynamic RAM (DRAM) and static RAM (SRAM), and operating the memory with an operating voltage. A value of a minimum operating voltage e.g. minimum write voltage and minimum read voltage, of the memory is determined, and stored in a non-volatile memory (NVM) location i.e. non-volatile register (12). A regulated voltage is provided as the operating voltage of the memory when the regulated voltage has the value of the minimum operating voltage.</td><td>Method for determining minimum operating voltage such as minimum retention voltage, minimum read voltage, minimum write voltage and minimum standby voltage, of a memory e.g. dynamic RAM (DRAM) and static RAM (SRAM), in an integrated circuit (claimed) of a data processing system, for determining when an alternative power supply voltage is switched to the memory.</td></tr>
<tr><td>US7725759</td><td>B2</td><td>91</td><td>System and method of managing clock speed in an electronic device</td><td>Vlsi Technology LLC</td><td>https://patentscout.innography.com/share/zYB04s1OtJ-ZgW2nfbircA%3D%3D</td><td>https://patentscout.innography.com/share/zYB04s1OtJ-ZgW2nfbircA%3D%3D/download</td><td>2005-06-27-ASSIGNMENT (SIGMATEL, INC.)|2008-06-05-ASSIGNMENT (CITIBANK, N.A.)|2009-01-01-ASSIGNMENT (SIGMATEL, LLC)|2009-12-05-FEE PAYMENT PROCEDURE|2009-12-05-FEE PAYMENT PROCEDURE|2010-02-19-ASSIGNMENT (CITIBANK, N.A.)|2010-02-19-ASSIGNMENT (CITIBANK, N.A.)|2010-04-13-ASSIGNMENT (CITIBANK, N.A., AS NOTES COLLATERAL AGENT)|2010-04-13-ASSIGNMENT (CITIBANK, N.A., AS COLLATERAL AGENT)|2010-05-05-INFORMATION ON STATUS: PATENT GRANT|2013-05-21-ASSIGNMENT (CITIBANK, N.A., AS NOTES COLLATERAL AGENT)|2013-11-01-ASSIGNMENT (CITIBANK, N.A., AS NOTES COLLATERAL AGENT)|2013-11-25-FEE PAYMENT|2015-12-07-ASSIGNMENT (SIGMATEL, LLC)|2015-12-07-ASSIGNMENT (SIGMATEL, INC.)|2015-12-07-ASSIGNMENT (FREESCALE SEMICONDUCTOR, INC.)|2017-07-18-ASSIGNMENT (NXP USA, INC.)|2017-09-20-MAINTENANCE FEE PAYMENT|2018-12-22-ASSIGNMENT (VLSI TECHNOLOGY LLC)|2019-02-11-ASSIGNMENT (NXP B.V.)|2019-12-03-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2020-03-17-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2021-07-20-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2021-11-24-MAINTENANCE FEE PAYMENT|2022-02-15-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW|2022-03-15-AIA TRIAL PROCEEDING FILED BEFORE THE PATENT AND APPEAL BOARD: INTER PARTES REVIEW</td><td>Clock frequency control method for moving picture experts group-1 audio layer-3 player, involves monitoring several master devices so as to receive input requesting increase to clock frequency of bus from master devices</td><td>The faster clock speeds are delivered with reduced power consumption.</td><td>Several master devices coupled to an advanced microprocessor bus, are monitored and an input requesting an increase to the clock frequency of the bus, is received from the master devices. Several high frequency flags are monitored by determining whether to enable the request to increase the clock frequency of the bus. The clock frequency is selectively increased in response to a high frequency flag being set.</td><td>For controlling clock frequency in moving picture experts group-1 (MPEG-1) Audio Layer-3 (MP3) player.</td></tr>
</table>

EXHIBIT 3

[ENTIRELY REDACTED]

EXHIBIT 4

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
TYLER DIVISION

ADVANCED DISPLAY TECHNOLOGIES OF TEXAS, LLC. **Plaintiff,** **vs.** **AU OPTRONICS CORP., ET AL** **Defendants.**	§ § § § § § § § § §	**CASE NO. 6:11-CV-011** **PATENT CASE**
ADVANCED DISPLAY TECHNOLOGIES OF TEXAS, LLC. **Plaintiff,** **vs.** **DELL, INC., ET AL** **Defendants.**	§ § § § § § § § § §	**CASE NO. 6:11-CV-391** **PATENT CASE**

MEMORANDUM OPINION AND ORDER

This Memorandum Opinion construes the terms in U.S. Patent Nos. 5,739,931 ("the '931 patent) and 6,261,664 ("the '664 patent") (together, the "Patents-in-Suit"). The Court also **GRANTS** Defendants' Motion for Summary Judgment that Claim 1 of U.S. Patent No. 6,261,664 is Invalid Under 35 U.S.C. § 112 ¶ 2 (Doc. No. 165, "SJ MTN").

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BACKGROUND

Advanced Display Technologies of Texas, LLC ("ADT") asserts the '931 and '664 patents against a number of defendants across two cases. In the interest in efficiency the Court held a consolidated *Markman* hearing in both cases. *See* 6:11cv011, Doc. No. 220; 6:11cv391, Doc. No. 190.

The following Defendants are named in case number 6:11cv011: AU Optronics Corporation, AU Optronics Corporation America, Apple, Inc., ASUS Computer International, ASUSTek Computer, Inc., Haier America Trading, LLC, Haier Group Corporation, Research in Motion Corporation, Research in Motion Limited, Sharp Corporation, Sharp Electronics Corporation, ViewSonic Corporation, and Vizio, Inc. (collectively "'011 Defendants").[1]

The following Defendants are named in case number 6:11cv391: Dell, Inc., Futurewei Technologies, Inc. d/b/a Huawei Technologies (USA), HTC Corporation, Lenovo, Inc., Motorola Mobility Holdings, Inc., Philips Electronics North America Corporation, Sanyo North America Corporation, Sony Corporation of America, Sony Ericsson Mobile Communications (USA), Inc., Sony Ericsson Mobile Communications AB, and Toshiba America Information Systems, Inc. (collectively "'391 Defendants").[2]

The use of "Defendants" throughout this Order refers to all remaining defendants across both the '011 and '391 cases.

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[1] ViewSonic Corporation, Haier American Trading, LLC, Haier Group Corporation, Sharp Corporation, and Sharp Electronics Corporation were dismissed prior to the *Markman* hearing.
[2] HTC Corporation, Motorola Mobility Holdings, Inc., Sony Ericsson Mobile Communications AB were dismissed prior to the *Markman* hearing.

The '931 Patent

The '931 patent is directed to an "optical illumination system" that preferably consists of a light transmitting means that receives diffuse light from a light source and transmits the light via "total internal reflection." '931 patent at ABSTRACT; *id.* at 1:60–67. In a preferred embodiment, the light transmitting means is in contact with a series of "microprisms" which capture and redirect the diffuse light which emerges from the microprisms as a "spatially directed light source." *Id.* at 1:60–2:14. The invention is described as directed to any application that requires "a low profile spatially directed light source." *Id.* at 1:44–46; 2:55–3:9. A preferred embodiment is depicted in Figure 1 of the patent:

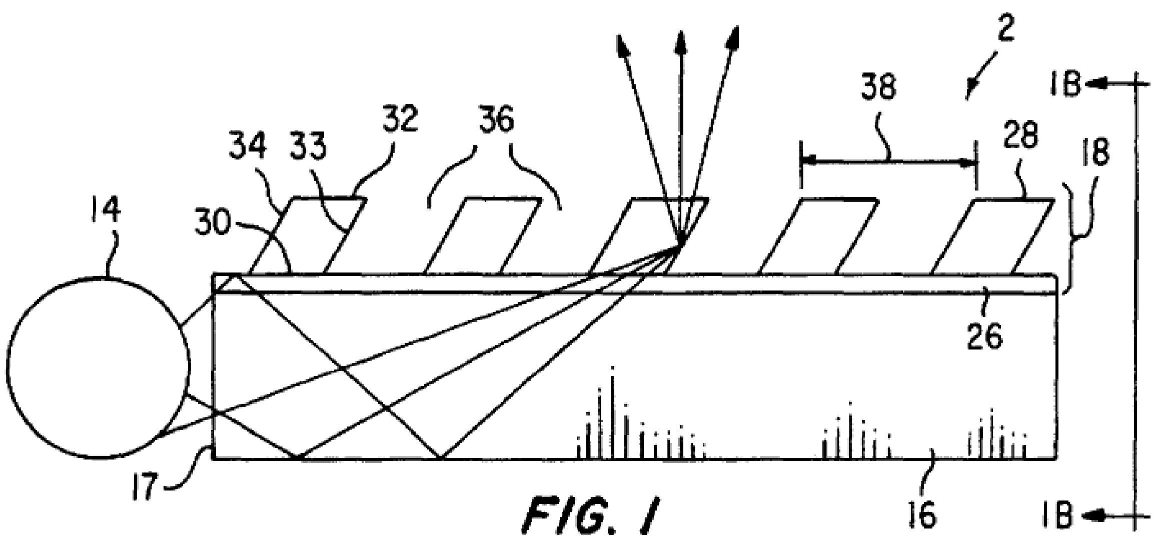

FIG. 1

In the above figure, the diffuse light source is depicted as item 14, the light transmitting means as 16, and an array of microprisms is depicted by 28. *Id.* at 3:64–4:15.

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The '664 Patent

The '664 patent is directed to an optical diffuser that can be made from a photopolymerizable process. '664 patent at 2:62–66. The process involves directing substantially collimated light through a substrate of transparent or translucent material into a film of photopolymerizable material. *Id.* The photopolymerizable material is exposed to the collimated light long enough to polymerize a portion of the material. *Id.* at 3:10–12. Thereafter, the non-polymerized portion is removed and the remaining structure can be used as a diffuser or to create a replica for embossing another material to create a diffuser. *Id.* at 3:12–17. The process is depicted in Figure 2 of the patent:

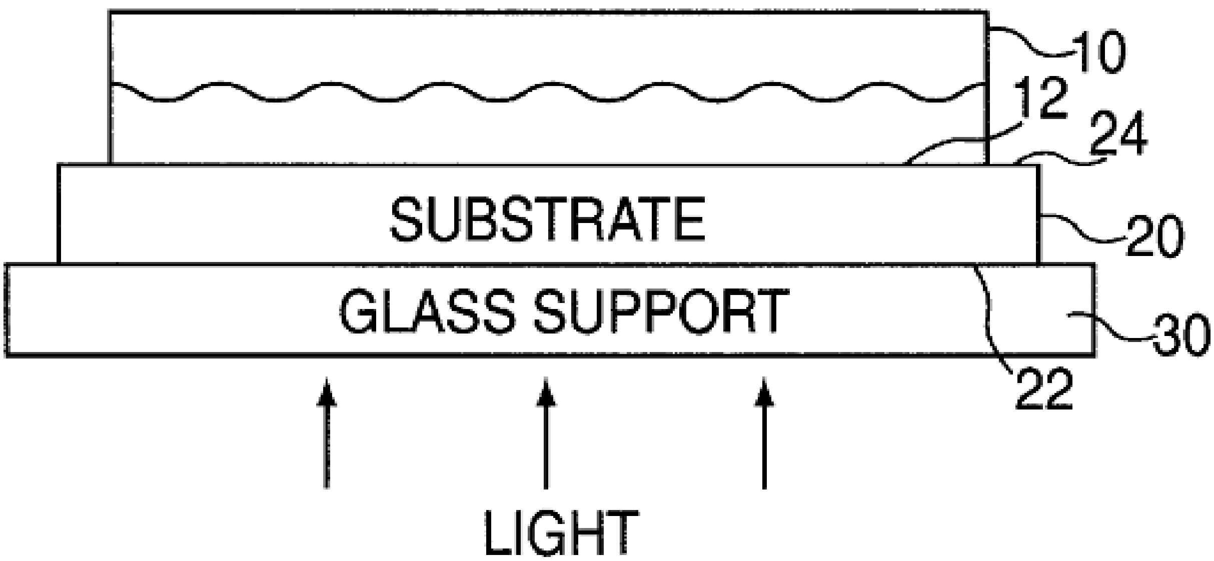

FIG. 2

The collimated light is directed through the optional glass support 30, through the bottom surface of the substrate 20, and through the photopolymerizable layer 10. *Id.* at 5:3–5. The collimated light is removed prior to the entire thickness of the photopolymerizable layer 10 has

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had an opportunity to polymerize (cross-link). *Id.* at 5:25–29. Thereafter, the unpolymerized portion is removed. *Id.* at 5:50–51.

APPLICABLE LAW

"It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude.'" *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc) (quoting *Innova/Pure Water Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). In claim construction, courts examine the patent's intrinsic evidence to define the patented invention's scope. *See id.*; *C.R. Bard, Inc. v. U.S. Surgical Corp.*, 388 F.3d 858, 861 (Fed. Cir. 2004); *Bell Atl. Network Servs., Inc. v. Covad Commc'ns Group, Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001). This intrinsic evidence includes the claims themselves, the specification, and the prosecution history. *See Phillips*, 415 F.3d at 1314; *C.R. Bard, Inc.*, 388 F.3d at 861. Courts give claim terms their ordinary and accustomed meaning as understood by one of ordinary skill in the art at the time of the invention in the context of the entire patent. *Phillips*, 415 F.3d at 1312–13; *Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1368 (Fed. Cir. 2003).

The claims themselves provide substantial guidance in determining the meaning of particular claim terms. *Phillips*, 415 F.3d at 1314. First, a term's context in the asserted claim can be very instructive. *Id*. Other asserted or unasserted claims can also aid in determining the claim's meaning because claim terms are typically used consistently throughout the patent. *Id*. Differences among the claim terms can also assist in understanding a term's meaning. *Id*. For example, when a dependent claim adds a limitation to an independent claim, it is presumed that the independent claim does not include the limitation. *Id*. at 1314–15.

"[C]laims 'must be read in view of the specification, of which they are a part.'" *Id.* (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995) (en banc)). "[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.'" *Id.* (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)); *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002). This is true because a patentee may define his own terms, give a claim term a different meaning than the term would otherwise possess, or disclaim or disavow the claim scope. *Phillips*, 415 F.3d at 1316. In these situations, the inventor's lexicography governs. *Id.* Also, the specification may resolve ambiguous claim terms "where the ordinary and accustomed meaning of the words used in the claims lack sufficient clarity to permit the scope of the claim to be ascertained from the words alone." *Teleflex, Inc.*, 299 F.3d at 1325. But, "'[a]lthough the specification may aid the court in interpreting the meaning of disputed claim language, particular embodiments and examples appearing in the specification will not generally be read into the claims.'" *Comark Commc'ns, Inc. v. Harris Corp.*, 156 F.3d 1182, 1187 (Fed. Cir. 1998) (quoting *Constant v. Advanced Micro-Devices, Inc.*, 848 F.2d 1560, 1571 (Fed. Cir. 1988)); *see also Phillips*, 415 F.3d at 1323. The prosecution history is another tool to supply the proper context for claim construction because a patent applicant may also define a term in prosecuting the patent. *Home Diagnostics, Inc., v. Lifescan, Inc.*, 381 F.3d 1352, 1356 (Fed. Cir. 2004) ("As in the case of the specification, a patent applicant may define a term in prosecuting a patent.").

Although extrinsic evidence can be useful, it is "'less significant than the intrinsic record in determining the legally operative meaning of claim language.'" *Phillips*, 415 F.3d at 1317 (quoting *C.R. Bard, Inc.*, 388 F.3d at 862). Technical dictionaries and treatises may help a court

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understand the underlying technology and the manner in which one skilled in the art might use claim terms, but technical dictionaries and treatises may provide definitions that are too broad or may not be indicative of how the term is used in the patent. *Id*. at 1318. Similarly, expert testimony may aid a court in understanding the underlying technology and determining the particular meaning of a term in the pertinent field, but an expert's conclusory, unsupported assertions as to a term's definition is entirely unhelpful to a court. *Id*. Generally, extrinsic evidence is "less reliable than the patent and its prosecution history in determining how to read claim terms." *Id*.

The patents-in-suit also contain means-plus-function limitations that require construction. Where a claim limitation is expressed in "means plus function" language and does not recite definite structure in support of its function, the limitation is subject to 35 U.S.C. § 112, ¶ 6. *Braun Med., Inc. v. Abbott Labs.*, 124 F.3d 1419, 1424 (Fed. Cir. 1997). In relevant part, 35 U.S.C. § 112, ¶ 6 mandates that "such a claim limitation 'be construed to cover the corresponding structure . . . described in the specification and equivalents thereof.'" *Id*. (citing 35 U.S.C. § 112, ¶ 6). Accordingly, when faced with means-plus-function limitations, courts "must turn to the written description of the patent to find the structure that corresponds to the means recited in the [limitations]." *Id*.

Construing a means-plus-function limitation involves multiple inquiries. "The first step in construing [a means-plus-function] limitation is a determination of the function of the means-plus-function limitation." *Medtronic, Inc. v. Advanced Cardiovascular Sys., Inc.*, 248 F.3d 1303, 1311 (Fed. Cir. 2001). Once a court has determined the limitation's function, "the next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id*. A "structure disclosed in the specification is 'corresponding' structure only if the specification or

prosecution history clearly links or associates that structure to the function recited in the claim." *Id*. Moreover, the focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id*.

Summary Judgment Standard

Summary judgment is appropriate when the record, as a whole, together with the affidavits, if any, show that there is no genuine issue as to any material fact, and the moving party is entitled to judgment as a matter of law. FED. R. CIV. P. 56(c); *Celotex Corp. v. Catrett*, 477 U.S. 317, 323–25 (1986). A fact is material if it might affect the outcome of the suit under the governing law. *Merritt-Campbell, Inc. v. RxP Prods., Inc.*, 164 F.3d 957, 961 (5th Cir. 1999). A "genuine issue" of material fact exists when a fact requires resolution by the trier of fact. *Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 248–49 (1986). When ruling on a motion for summary judgment, the Court is required to view all justifiable inferences drawn from the factual record in the light most favorable to the nonmoving party. *Matsushita Elec. Indus. Co., Ltd v. Zenith Radio Corp.*, 475 U.S. 574, 587 (1986); *Adickes v. S.H. Kress & Co.*, 398 U.S. 144, 158-59 (1970); *Merritt-Campbell, Inc.*, 164 F.3d at 961.

Indefiniteness

A claim is invalid as indefinite under 35 U.S.C. § 112, ¶ 2 if it fails to particularly point out and distinctly claim the subject matter that the applicant regards as the invention. The party seeking to invalidate a claim as indefinite must show by clear and convincing evidence that one skilled in the art would not understand the scope of the claim when read in light of the specification. *Intellectual Prop. Dev., Inc. v. UA-Columbia Cablevision of Westchester, Inc.*, 336 F.3d 1308, 1319 (Fed. Cir. 2003). The test for indefiniteness is stringent—a claim is invalid

as indefinite if it is not "amenable to construction." *Exxon Research & Eng'g Co. v. United States*, 265 F.3d 1371, 1375 (Fed. Cir. 2001). The definiteness requirement of § 112, ¶ 2 "focuses on whether the claims, as interpreted in view of the written description, adequately perform their function of notifying the public of the [scope of the] patentee's right to exclude." *S3 Inc. v. nVIDIA Corp.*, 259 F.3d 1364, 1371–72 (Fed. Cir. 2001) (citing *Solomon*, 216 F.3d at 1379). Section 112, ¶ 2 also requires "that the claims be amenable to construction, however difficult that task may be." *Exxon Research*, 265 F.3d at 1375. Because a claim is presumed valid, a claim is indefinite only if the "claim is insolubly ambiguous, and no narrowing construction can properly be adopted." *Id.*; *see also Honeywell Int'l, Inc. v. Int'l Trade Comm'n*, 341 F.3d 1332, 1338-39 (Fed. Cir. 2003).

CLAIM TERMS

The '931 Patent

"a light transmitting means"

ADT's Proposal	'011 Defendants' Proposal	'391 Defendants' Proposal
Function: transmitting light via reflection Structure: a light pipe, light wedge or waveguide, and any equivalents of that structure;	Function: transmitting light via reflection Structure: a light pipe, light wedge or waveguide, and any equivalents of that structure;	Function: transmitting light via reflection Structure: a light pipe, light wedge or waveguide;

"having means for accepting light"

ADT's Proposal	'011 Defendants' Proposal	'391 Defendants' Proposal
Function: accepting light from a light source Structure: light accepting surface 17 or 17a, and any equivalents of that structure	Function: accepting light from a light source Structure: light accepting surface 17 or 17a, and any equivalents of that structure	Function: accepting light from a light source Structure: light accepting surface 17 or 17a;

The parties have the same dispute regarding "a light transmitting means" and "having means for accepting light." ADT and the '011 Defendants agree that the proper constructions of both phrases should include "and any equivalents of that structure." *See* 611cv011, Doc. No. 194, "PL. BRIEF" at 1–2. The '391 Defendants disagree, and contend that adding such language is both confusing and unnecessary. *See* 6:11cv391, Doc. No. 172, "'391 DEF. RESP." at 28–29.

The law explicitly states that means-plus-function claims "shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof." 35 U.S.C. § 112 (2006). As such, ADT and the '011 Defendants' proposed constructions are consistent with controlling law regarding mean-plus-function claim limitations. *See Mediatek, Inc. v. Sanyo Elec. Co.*, 513 F. Supp. 2d 778, 789 (E.D. Tex. 2007).

Accordingly, the Court adopts ADT and the '011 Defendants' proposed constructions and construes: (1) "a light transmitting means" as "transmitting light via reflection" with the corresponding structure being "a light pipe, light wedge or waveguide, and any equivalents of that structure;" and (2) "having means for accepting light" as "accepting light from a light source" with the corresponding structure being "light accepting surface 17 or 17a, and any equivalents of that structure."

"microprism"

ADT's Proposal	'011 Defendants' Proposal	'391 Defendants' Proposal
small optical material consisting of no less than two surfaces that are at an angle relative to each other so as to reflect or refract light	a small prism having a light input surface parallel to a light output surface	a small prism having a light input surface parallel to a light output surface

Based on the parties' proposed constructions, it appears that they agree that "micro" should be construed as "small." The crux of the parties' dispute is the proper meaning of "prism." ADT contends that prism (or microprism) is used in the claims according to its ordinary and customary meaning; therefore, it should be afforded such a construction. PL. BRIEF 3–4. As such, ADT proposes a dictionary definition that it deems embodies the ordinary meaning of "prism."

Defendants argue that their proposed construction is grounded in the intrinsic record. *See* 611cv011, Doc. No. 204, "'011 DEF. RESP." at 15–17. Defendants contend that the entire specification is drawn toward an invention that utilizes microprisms with a light input surface and light output surface configured parallel to one another. *Id.* Defendants also look to the prosecution history of U.S. Patent No. 6,129,439 ("the '439 patent"), which shares a common ancestor with the '931, where ADT allegedly avoided an obviousness rejection by arguing that "prism" must have parallel congruent polygons as bases. *Id.* at 17.

Defendants seek to limit "microprism" to having a light input surface parallel to a light output surface. '011 DEF. RESP. at 15–17. Should the Court adopt Defendants' proposed construction, it would effectively read a limitation of one claim into another and render a dependent claim superfluous. Independent Claim 7 identifies a microprism "comprising" a light input surface, light output surface, and at least one sidewall. '931 patent at 9:30–10:6. Claim 11, which depends from Claim 7, explicitly claims a configuration of the microprism "wherein said output surface is parallel to said input surface." *Id.* at 10:15–17. Other claims of the '931 patent broadly disclose microprisms without restricting the input and output surface to being parallel. *See e.g.*, '931 patent at 8:54–68. As such, the Court cannot read the explicit limitation of parallel surfaces into the other claims. *See Amgen Inc. v. Hoechst Marion Roussel, Inc.*, 314

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F.3d 1313, 1326 (Fed. Cir. 2003) ("Our court has made clear that when a patent claim does not contain a certain limitation and another does, that limitation cannot be read into the former claim").

Defendants' proposal also requires improperly importing specific embodiments from the specification into the claims. *See e.g.*, '931 patent at 1:60–2:5 ("In one preferred embodiment . . . [t]he microprism comprises a light input surface in contact with the waveguide and a light output surface distal to and parallel with the light input surface."). Again, as the claims demonstrate, the patentee explicitly claimed such an embodiment via Claim 11, yet the other claims fail to limit the claimed mircroprisms to parallel surfaces. By explicitly modifying the term in one claim, there is a strong implication that the modifying concept is not part of the ordinary meaning of the term. *See Phillips*, 415 F.3d at 1314 (holding that claiming "steel baffles" creates a strong implication that term "baffles" does not include the "steel" modifier.).[3]

ADT's construction, on the other hand, purportedly captures the ordinary meaning of the term within the context of the claims and specification. PL. BRIEF 3–4. ADT's construction, however, fails to evaluate the ordinary meaning of the term "microprism" in view of the specification and instead invokes a broad dictionary definition without reference to the context and usage of the term in the specification. *See Texas Digital Systems, Inc. v. Telegenix, Inc.*, 308 F.3d 1193, 1204 (Fed. Cir. 2002). Instead, the Court must determine the ordinary meaning by "ascertain[ing] possible meanings that would have been attributed to the words of the claims by those skilled in the art, and by further utilizing the intrinsic record to select from those possible meanings the one or ones most consistent with the use of the words by the inventor." *Id.*

[3] Defendants also contend that the patentee disclaimed the full meaning of the term "microprism" during the prosecution of U.S. Patent No. 6,129,439, a related patent that shares a common ancestor with the '931 patent. '011 DEF. RESP. at 15–17. A review of the '439 prosecution does not reveal an unambiguous disclaimer nor does it demonstrate that the patentee attempted to overcome prior art because the art included non-parallel input and output surface. *See* 011 DEF. RESP., Ex. 4 and 5.

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The '931 patent is directed to an "optical illumination system." The system consists of a waveguide and an array of microprisms. '931 patent at ABSTRACT. Optionally, the system may include microlenses. *See* '931 patent at 1:15–22. Accordingly, the subject matter of the '931 patent involves concepts of "optics," which is a subfield of physics related to the behavior of light. Therefore, in considering the meaning of terminology used in the '931 patent, one of skill would adopt the meanings of terms as found in the field of physics, particularly the subfield of "optics."

An illustrated "microprism" 28 is described as receiving light through its input surface, which is then reflected off its sidewalls, and exits the microprism as a spatially directed light source. *Id.* at 4:9–15. The specification further describes the illustrated microprism 28 as being "constructed from any transparent solid material." *Id.* at 4:27–28. Accordingly, the specification indicates that a "microprism" is a body of transparent solid material for reflecting light. In regard to its geometric configuration, the specification describes the preferred microprism as being a six-sided geometrical shape and depicts it as a rhomboid. *See id.* at 5:24–41.

ADT has advanced a dictionary definition in construing the term "prism." As seen from ADT's proposed construction, the specification, and the prosecution history, a definition of "prism" is highly contextual. When used in a mathematical context, such as in geometry, the definition of "prism" merely expresses the geometric configuration and relationship of its constituent surfaces. As used in the context of optics, however, the definition of "prism" focuses on its characteristic of being in the form of a transparent solid body and its useful function of reflecting or refracting light.

After a review of a number of dictionary definitions, the specification and prosecution history, one accepted, and fitting definition of the term "prism" in the context of optics is: "a

transparent polygonal solid, which is a three dimensional body formed by intersecting surfaces that are each a closed plane figure bounded by three or more line segments, for reflecting or refracting light." *See* http://www.thefreedictionary.com/prism. This definition is consistent with the manner in which the term "prism" and hence, "microprism," is used in the '931 patent. As such, the Court construes "microprism" as "a small transparent polygonal solid, which is a three dimensional body formed by intersecting surfaces that are each a closed plane figure bounded by three or more line segments, for reflecting or refracting light."

"[input surface] for receiving a portion of light transmitting through said light transmitting means"

ADT's Proposal	'011 Defendants' Proposal	'391 Defendants' Proposal
the outer layer of the microprism that receives a portion of light transmitting through the light transmitting means	the outer surface of the microprism that receives a portion of light transmitting through the light transmitting means	the outer surface of the microprism that receives a portion of light transmitting through the light transmitting means

The only difference between the parties' proposed constructions is whether "surface" should be redefined as "layer." ADT contends that the ordinary meaning of "surface," in context of the '931 patent, equates to a "layer." PL. BRIEF at 7. Defendants counter that the surface need not be redefined and that the term is used without any special meaning throughout the '931 specification. '011 DEF. RESP. at 8–11.

The '931 patent describes the microprisms as having input and output surfaces and never assigns them a meaning contrary to the common understanding of the word "surface." Given the complexity of this technology, and the lack of any special meaning in the '931 specification, there is no need to further confuse the issues, and ultimately the jury, by arbitrarily construing a commonly used term such as "surface." As such, there is no need to construe "surface," and the Court adopts the following construction for the phrase "[input surface] for receiving a portion of

light transmitting through said light transmitting means:" "the outer surface of the microprism that receives a portion of light transmitting through the light transmitting means."

"optically coupled"

ADT's Proposal	'011 Defendants' Proposal	'391 Defendants' Proposal
in a relationship where the combination of optical components allows light to be transferred between the optical components. Optical components may be optically coupled if there is an intervening optical component.	<u>ViewSonic, AUO, VIZIO, ASUS</u>: optically connected without an intervening optical component <u>RIM, Apple</u>: No construction necessary; In the alternative: in a relationship where the combination of optical components allows light to be transferred between the optical components.	No construction necessary. In the alternative: in a relationship where the combination of optical components allows light to be transferred between the optical components.

RIM, Apple, and the '391 Defendants contend that no construction is necessary and that "optically coupled" should be given its ordinary meaning. '011 DEF. RESP. at 25–26. In the alternative, RIM, Apple, and the '391 Defendants propose the same construction as ADT, excluding the second sentence of ADT's construction, which they argue is confusing and unnecessary. *Id.*

Defendants ViewSonic, AUO, VIZIO, and ASUS argue that the '931 patent precludes intervening optical components between two "optically coupled" components and propose a construction as such. '011 DEF. RESP. at 27–28. ADT disagrees. PL. BRIEF at 9–12.

As an initial matter, because the parties disagree regarding the ordinary meaning of "optically coupled" the Court is required to construe the term. *O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008). While ADT, RIM, Apple, and the '391 Defendants generally agree, at least in some instances, that two optical components may be

optically coupled if there is an intervening optical component (*see* '011 DEF. RESP. at 25–26), AUO, VIZIO, and ASUS wholesale disagree. *See* '011 DEF. RESP. at 27–28. Therefore, the crux of the parties' dispute amounts to whether two optical components may be "optically coupled" despite the presence of an intervening optical component(s) between them.

The '931 specification discloses an embodiment that includes the coupling of microprisms and a light transmitting means, or optical components, despite the presence of an intervening optical component. *See* '931 patent at 5:1–9; Figure 1A. Indeed, Figure 1A of the '931 demonstrates that the array of microprisms is optically coupled to the waveguide, with an "adhesion promoting layer" between them. *See id.* Therefore, a construction that excludes a preferred embodiment would be improper.

AUO, VIZIO, and ASUS contend that the "adhesion promoting layer" is not an "optical component" because "optical components" must change the spatial direction of the light. *See* Docket No. 225, "*MARKMAN* TRANSCRIPT" at 131–132; '011 DEF. RESP. at 27–28. However, the '931 patent does not explicitly limit optical components to components that change the spatial direction of the light, and the "adhesion promoting layer" is specifically referred to as "light transmissive;" therefore, may be reasonably considered an optical component. *See* '931 patent at 5:1–9.

Additionally, AUO, VIZIO, and ASUS's proposed construction would rewrite the ordinary meaning of the term "coupled" to mean "connected." In other words, the proposed construction would suggest only a direct passage of light between optical components, which is belied by the disclosure of Figure 1A as explained above, and contrary to the ordinary meaning of "coupled."

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Nevertheless, ADT's proposed construction is cumbersome and may confuse the jury. Accordingly, the Court construes "optically coupled" as "in a relationship where the combination of optical components allows light to be transferred either directly or indirectly between the optical components."

"sidewall"

ADT's Proposal	'011 Defendants' Proposal	'391 Defendants' Proposal
a wall forming a side of a microprism	wall forming the side of a microprism between a light input surface and a light output surface	wall forming the side of a microprism between a light input surface and a light output surface

The parties agree that a "sidewall" is "a wall forming a side of a microprism." Defendants, however, contend that the specification and claims require the side wall to be located "between a light input surface and a light output surface." Defendants contend that the '931 specification and disclosure, citing to the Summary of the Invention, requires that a sidewall be positioned between the light input and output surfaces. '011 DEF. RESP. at 12–13. ADT disagrees. PL. BRIEF at 12–14.

The claims themselves provide substantial guidance in determining the meaning of particular claim terms. *Phillips*, 415 F.3d at 1314. Differences among the claim terms can also assist in understanding a term's meaning. *Id*. Claim 1 of the '931 patent explicitly requires the "sidewalls" be located between the light input and output surfaces. '931 patent at 8:42–50 ("a first pair of sidewalls disposed between said light input surface and said light output surface."). Claim 3 of the '931 patent, however, does not require the sidewall be positioned between the light input and output surfaces. Accordingly, Defendants' proposal would improperly limit the broader disclosure of Claim 3 without any clear disavowal of claim scope by the patentee. As such, the Court construes "sidewall" as "a wall forming a side of a microprism."

"[at least one sidewall] positioned for effecting total internal reflection of a portion of light received by said light input surface"

ADT's Proposal	'011 Defendants' Proposal	'391 Defendants' Proposal
at least one sidewall of the microprism is in a position that causes total internal reflection of a portion (some, but not all) of light received by the light input surface	Apple: at least one sidewall is angled to cause total internal reflection of the portion of light received by the light input surface that emerges from the microprism upon striking the "sidewall" Other Defendants: at least one sidewall is angled to cause "total internal reflection" of the light that enters the light input surface and strikes that "sidewall"	at least one sidewall is angled to cause "total internal reflection" of the light that enters the light input surface and strikes that "sidewall"

During the *Markman* hearing, ADT essentially agreed, based on Defendants' presentation, that the difference between the parties' proposed constructions regarding the "position" or "angle" of the sidewall is irrelevant. *MARKMAN* TRANSCRIPT at 117–118.

The primary dispute between the parties is directed at the meaning of "effecting total internal reflection of a portion of light received by said light input surface." ADT's construction only defines the phrase "a portion" as "some, but not all," and otherwise tracks the claim language. In other words, ADT contends a sidewall should cause total internal reflection of some of the light received by the light input surface.

All Defendants, except Apple, propose a construction that for all intents and purposes construes "a portion" as the actual light that enters the light input surface and strikes a particular sidewall. Apple, on the other hand, proposes a construction that focuses on the "portion of" light that actually "emerges" from the microprism after striking a particular sidewall.

Claim 3 of the '931 patent recites "at least one sidewall having an edge defined by said light input surface and positioned for effecting total internal reflection of a portion of light received by said light input surface." '931 patent at 8:64–67. Turning to the specification, Figure 4 describes an embodiment with two light sources:

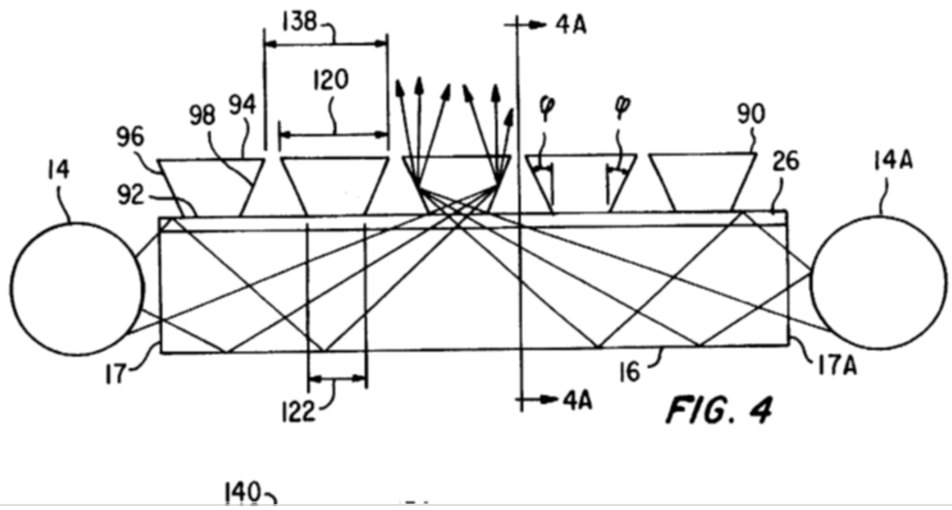

FIG. 4

As shown, light from source 14 propagates down waveguide 16 and enters a microprism through its light input surface. The light from source 14 is reflected by one sidewall and exits the light output surface. Further, the reflection is indicted to be by total internal reflection (TIR). *See* '931 patent at 4:9–15. Similarly, light from source 14A, at the opposite end of waveguide 16, propagates down the waveguide and enters the microprism through the light input surface. The light from source 14A is reflected by the opposite sidewall and exits the light output surface. Again, the reflection is indicated to be by TIR.

As shown, the total light received by the light input surface of the microprism is light received from both source 14 and source 14A. The light received by TIR from each of the "at least one" sidewalls individually, however, is only a "portion" of the total light received by the

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light input surface. Accordingly, Claim 3 of the '931 patent reads on the dual light source embodiment of Figure 4.

Another embodiment, having only one light source, is shown in Figure 1:

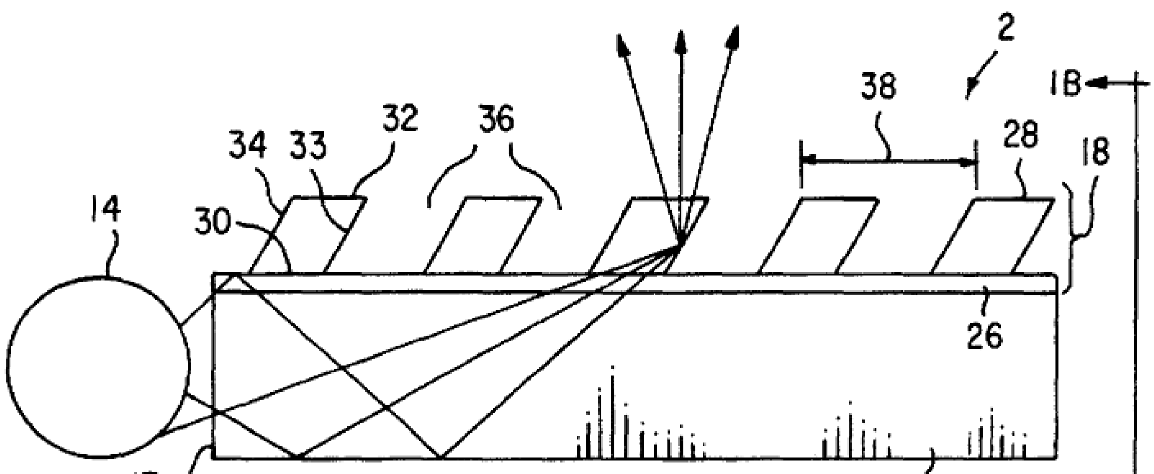

FIG. 1

In this embodiment, light from source 14 propagates down waveguide 16 and enters a microprism through the light input surface. The light is reflected by one sidewall by TIR, and exits through the light output surface. Unlike the two light source embodiment, however, the total amount of light entering the microprism through the light input surface consists of light from single source 14. Accordingly, not just a "portion" of the light received by the input surface is reflected by "at least one" sidewall, all of the received light is reflected. Because all of the received light can be said to also be a "portion" of the received light, Claim 3 also reads on the embodiment disclosed in Figure 1.

ADT contends that the recitation of "a portion of light received by said light input surface" means, for example, in the context of the embodiment of Figure 1, that only some of the light from source 14 that enters the microprism through the input surface must be reflected by

TIR. ADT's contention, however, is unsupported by the specification. In both embodiments, all of the light entering a microprism is reflected by TIR. Nowhere is there an indication that only some of the light received by the light input surface is reflected by TIR. ADT's construction is not supported when read in view of the specification.

Defendants contend that the phrase means not all light that enters the microprism through the light input surface must strike a given a sidewall. Defendants' proposed construction is consistent with both embodiments. Defendants' construction allows for a dual light source embodiment, wherein only some of the light entering a microprism through the light input surface is reflected by each of the sidewalls. The construction also allows for a single light source embodiment, wherein all of the light that enters the light input surface, which also constitutes "a portion" of entering light, is reflected by only a single sidewall. As such, the Court construes "[at least one sidewall] positioned for effecting total internal reflection of a portion of light received by said light input surface" as "at least one sidewall is angled to cause total internal reflection of the light that enters the light input surface and strikes that sidewall."

The '664 Patent

"polymerized material layer"

ADT's Proposal	'011 Defendants' Proposal	'391 Defendants' Proposal
a single thickness of material comprised of a substance that is formed by polymerization (such as plastic), and that does not contain any unpolymerized materials	single thickness of material formed by polymerization	single thickness of material formed by polymerization

The parties essentially agree that a "polymerized material layer" is a "single thickness of material formed by polymerization." ADT contends that it will aid the jury to include an example of a type of material formed by polymerization. PL. BRIEF at 19–21. ADT also argues

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that the polymerized material layer may not contain any unpolymerized materials. *Id.* Defendants disagree. '011 DEF. RESP. at 30–31.

As an initial matter, there is no need to complicate the construction by adding the parenthetical "such as plastic" in the construction. In fact, the additional language may confuse rather than aid the jury. Second, ADT's exclusion of any unpolymerized materials reads out an embodiment disclosed in the specification. The '664 specification describes a method of producing the "polymerized material layer" without having to remove any unpolymerized material. *See* '664 patent at 6:36–7:8. Therefore, the Court construes "polymerized material layer" as a "single thickness of material formed by polymerization."

"which layer has a highly modulated surface having smooth bumps ranging from about 1 micron to about 20 microns in both height and width"

ADT's Proposal	'011 Defendants' Proposal	'391 Defendants' Proposal
a layer whose surface is substantially covered with smooth bumps in the range of 1 micron to 20 microns that have aspect ratios that are [1] sufficient to make the light source uniform and [2] sufficient hide the structural features of the individual patterned light source so that the features or patterns of the light source are not evidence, and that are smooth enough to diffuse light in a forward, used direction, so as to [1] minimize optical backscatter and to [2] increase optical efficiency **"highly modulated:"** a surface substantially covered with smooth bumps that have	<u>AUO, Vizio, ASUS</u>: Indefinite; In the alternative: the polymerized layer has a surface of smooth bumps that are adjusted proportionately enough to diffuse light without exposure to the air and have a height and width within about 1 micron and 20 microns <u>RIM</u>: Indefinite; In the alternative: the layer has a surface formed to include many smooth bumps with heights and widths between about 1 and about 20 microns; for example, the surface 42	Indefinite In the alternative: the layer has a surface formed to include many smooth bumps with heights and widths between about 1 and about 20 microns; for example, the surface 42 shown in Figure 3

aspect ratios (*i.e.*, the ratio of height to width) that are [1] sufficient to make the light source uniform and [2] sufficient to hide the structural features of the individual patterned light source so that the features or patterns are not evidence in the image **“smooth bumps:”** bumps having surfaces that are smooth enough to diffuse light in a forward, used direction, so as to [1] minimize optical backscatter and to [2] increase optical efficiency	shown in Figure 3 Apple: Indefinite; In the alternative: the polymerized material layer has a surface formed of smooth bumps that exhibit high aspect ratios and have a height and width within about 1 and about 20 microns	

Defendants contend that Claim 1 of the ‘664 patent is indefinite under 35 U.S.C. § 112 ¶ 2 because the claim uses two terms of degree, “highly modulated” and “smooth bumps,” which lack any objective anchor against which one of skill in the art can compare a potentially infringing products to determine whether it meets the limitations of Claim 1. *See generally* SJ MTN. ADT disagrees and contends that terms of degree may be construed to mean the degree necessary to serve the inventor’s purpose as disclosed in the intrinsic record. Docket No. 176 (“SJ OPP.”) at 5.

Highly Modulated

“When a word of degree is used, the district court must determine whether the patent’s specification provides some standard for measuring that degree.” *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1351 (Fed. Cir. 2005). Claim 1 of the ‘664 recites:

> 1. An optical diffuser comprising a polymerized material layer on a transparent or translucent substrate, which layer has a **highly modulated** surface having smooth bumps ranging from about 1 micron to about 20 microns in both height and width.

Defendants contend that the neither the claim language, nor the specification, offer a clue as to the difference between a "highly modulated" and "modulated" surface. SJ MTN at 1–4. ADT, on the other hand, contends that the specification provides guidance by way of describing the "inventor's purposes" for using a "highly modulated" surface. SJ OPP. at 5.

The '664 specification includes a section entitled "highly modulated surface," where the surface 42, of the photocrosslinked component 40, is described as highly modulated by way of exhibiting smooth bumps from about 1 micron to about 20 microns in both height and width. '664 Patent at 5:65–6:35. In other words, the specification merely repeats the language of Claim 1. The specification further describes the "aspect ratios, i.e., the ratios of the heights to the widths, of the bumps on the highly modulated surface 42 . . . [as] quite high." *Id.* Next, the specification describes how to make the highly modulated surface. *Id.* Last, the specification discloses that the "photopolymerized component 40" may be used in a number of ways, including using the component as a light diffuser for either a projection viewing screen or a liquid crystal display (LCD) illumination system to hide the system's structural features. *Id.* The highly modulated surface is shown in Figure 3:

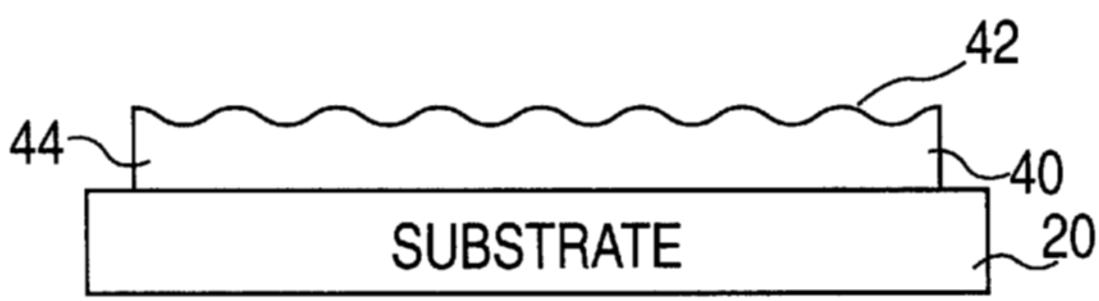

FIG. 3

In sum, viewing the '664 patent as a whole, the "highly modulated surface" is described as composed of smooth bumps from about 1 micron to 20 microns in both height and width, where the aspect ratios of the bumps are "quite high." '664 patent at 5:65–6:35. Additionally, the component with the highly modulated surface may be used to hide an illumination system's structural features. *Id.*

The '664 patent, however, fails to provide a standard for measuring the difference between a mere modulated surface and a *highly* modulated surface. In fact, the patent provides conflicting descriptions of the kinds of bumps that comprise a highly modulated surface. The text of the specification requires the "bumps" on the surface be taller than they are wide ('664 patent at 5:65–6:35); yet the accompanying Figure 3 depicts bumps that are wider than they are tall. As such, the patent fails to provide a person of ordinary skill in the art an objective anchor against which a potentially infringing product may be compared to determine whether the product meets the highly modulated limitation of Claim 1.

ADT contends that the claim itself describes *how* the surface is modulated, *i.e.*, with smooth bumps ranging from about 1 micron to about 20 microns. SJ Opp. at 4. ADT further argues that the ordinary meaning of "modulated" informs a person of ordinary skill in the art that the surface is "substantially covered with smooth bumps." *Id.* Even accepting both of these contentions as true, there is no guidance in the intrinsic record to determine what comprises a *highly* modulated surface compared with a mere modulated surface.

In an effort to fill the gap, ADT relies on an expert declaration and *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc.*, 796 F.2d 443, 450 (Fed. Cir. 1986), to argue that terms of degree may be construed "to mean the degree necessary to serve the inventor's purposes." SJ Opp. at 4–5. ADT, via its expert's declaration, contends that the '664 specification teaches that

the "purpose" of the surface of the diffuser layer is met when it is highly modulated to the extent that it is sufficient to: (1) make the light source uniform; and (2) hide the structural features of the individual patterned light source. *Id.* at 4–9.

As an initial matter, while expert testimony is "useful . . . for a variety of purposes," it should be discounted when it is inconsistent with a claim construction as required by the claims and specification. *Phillips*, 415 F.3d at 1318. Additionally, ADT's reliance on *Bausch & Lomb, Inc.*, is overstated given that the case was decided long before the Federal Circuit clarified the roles of different evidence when construing claims. That said, even considering ADT's expert's declaration, ADT's position that the '664 specification provides objective guidance regarding what comprises a highly modulated surface is pure conjecture. Unlike *Bausch & Lomb Inc.*, the '664 specification provides no objective framework regarding what is necessary to serve the inventor's purposes.

While ADT identifies an alleged purpose of a "highly" modulated surface as being one of hiding structural features of the light source, the specification instead describes that feature only as a *potential* use of the surface as a component in an LCD display. *See* '664 patent at 6:30–34. The same is true for the alleged purpose of making the light source uniform. The '664 specification identifies one of many functions for a diffuser in an LCD display to be that of light source uniformity. *Id.* at 7:60–8:22. A potential use is not a purpose. Accordingly, ADT's attempt to divine objective guidance from the specification via expert testimony does not save the claims from a finding of indefiniteness.

ADT's proposed construction, moreover, is potentially indefinite itself. For example, ADT fails to provide any objective limits or boundaries of what is "sufficient" light uniformity and "sufficient" hiding of structural features. Additionally, ADT's expert states that the

"structural features of the individual patterned light source" are "irregularities deliberately placed in or on the waveguide" that enable light to escape from the waveguide. PL. BRIEF, EX. 7 ¶¶ 20–21. Under ADT's construction, whether the surface of a diffuser is "highly modulated" would depend on features of a particular waveguide with which the diffuser happens to be used. As such, determining whether a particular diffuser infringes would change depending on the waveguide.

Indeed, Defendants examined ADT's expert on this precise issue. Defendants presented ADT's expert with an accused diffuser and two different waveguides and he conceded that the accused diffuser hides structural features of one waveguide, but fails to hide the structural features of the second waveguide. SJ MTN, EX. 1 at 122–131. Such a result fails to provide the public notice of whether or not they infringe. *See Halliburton Energy Servs., Inc. v. M-I, LLC*, 514 F.3d 1244, 1255 (2008) ("When a proposed construction requires that an artisan make a separate infringement determination for every set of circumstances in which the composition may be used, and when such determination are likely to result in differing outcomes (sometimes infringing and sometimes not), that construction is likely to be indefinite."). As such, Claim 1 of the '664 patent is indefinite because the claims and specification fail to provide an objective standard to determine whether the a surface is "highly" modulated.

Smooth Bumps

Defendants also argue that the term "smooth bumps" is indefinite because the claims and patent specification fail to provide an objective standard to determine whether a bump is "smooth." SJ MTN at 8–9. ADT counters, much like its argument regarding "highly modulated," that one of ordinary skill in the art would understand the bounds of "smooth bumps" in the context of the patent specification. SJ OPP. at 9–15. ADT proposes a functional construction

which purportedly captures the "inventor's purposes" of "minimizing optical backscatter" and "increas[ing] optical efficiency." *Id.* at 10–13.

ADT proposes an understanding of "smooth" in the unrelated context of surface roughness. ADT again leverages off an expert declaration to supplement the disclosure of the specification as to possible functional uses and not actual "purposes" of the invention. Contrary to ADT's contentions, the '664 specification fails to link the "smooth bumps" to the functions of minimizing backscatter and increasing optical efficiency. For example, while ADT is correct that the specification describes a "highly desirable" possible function of the invention as minimizing backscatter and increasing optical efficiency (*see* '664 patent at 1:50–55), the specification fails to tie the "smoothness" of the bumps to such a potential function.

Even assuming the "smoothness" of the bumps did aid in minimizing backscatter or increased optical efficiency, the '664 specification fails to provide any objective anchor to determine *how* smooth the bumps must be to facilitate such a function; or even how to measure the "smoothness" of the bumps to reach the proper threshold of smoothness. Additionally, ADT's proposed construction itself provides no such guidance by using such unbounded and imprecise terms as "minimizing" and "increasing." ADT essentially argues for a construction of an unbounded term of degree using other terms of degree.

ADT argues, via its expert declaration, that the specification provides objective anchors to measure minimizing backscatter and increasing optical efficiency because it teaches that the invention is designed to improve upon the prior art. SJ OPP. at 13. As such, ADT contends that a potential infringer could simply test the amount of reduction of backscatter by using "traditional diffusers" as the benchmark. *Id.* The specification, however, fails to provide any guidance regarding which prior art device should serve as a benchmark to evaluate whether the

backscatter is sufficiently minimized or the efficiency is increased. ADT's proposal still fails to provide a person of skill an objective anchor to measure the supposed functions of the smooth bumps.

Much like the "highly modulated" term, the '664 claims and specification simply fail to provide any objective guidance to determine whether a bump is "smooth." While ADT identifies alleged purposes of the invention, nothing in the specification ties the "smoothness" of the bumps to "minimizing" of backscatter or the "increasing" of optical efficiency. ADT cannot simply supplement the specification with an expert declaration absent some link in the written description tying the specific smoothness of the bumps to the purported functions of the invention. Again, a potential function is not a purpose. Accordingly, Claim 1 of the '664 patent is indefinite because the claims and specification fail to provide an objective standard to determine whether a bump is "smooth."

CONCLUSION

For the foregoing reasons, the Court interprets the claim language in this case in the manner set forth above. For ease of reference, the Court's claim interpretations are set forth in a table as Appendix A. Additionally, Defendants' Motion for Summary Judgment that Claim 1 of U.S. Patent No. 6,261,664 is Invalid Under 35 U.S.C. § 112 ¶ 2 (Doc. No. 165) is **GRANTED.**

So ORDERED and SIGNED this 12th day of July, 2012.

LEONARD DAVIS
UNITED STATES DISTRICT JUDGE

APPENDIX A

U.S. Patent No. 5,739,931

Claim Term	Court's Construction
a light transmitting means	Function: transmitting light via reflection Structure: a light pipe, light wedge or waveguide, and any equivalents of that structure
having means for accepting light	Function: accepting light from a light source Structure: light accepting surface 17 or 17a, and any equivalents of that structure
microprism	a small transparent polygonal solid, which is a three dimensional body formed by intersecting surfaces that are each a closed plane figure bounded by three or more line segments, for reflecting or refracting light
[input surface] for receiving a portion of light transmitting through said light transmitting means	the outer surface of the microprism that receives a portion of light transmitting through the light transmitting means
optically coupled	in a relationship where the combination of optical components allows light to be transferred either directly or indirectly between the optical components
sidewall	a wall forming a side of a microprism
[at least one sidewall] positioned for effecting total internal reflection of a portion of light received by said light input surface	at least one sidewall is angled to cause total internal reflection of the light that enters the light input surface and strikes that sidewall

U.S. Patent No. 6,261,664

Claim Term	Court's Construction
polymerized material layer	single thickness of material formed by polymerization
which layer has a highly modulated surface having smooth bumps ranging from about 1 micron to about 20 microns in both height and width	indefinite

EXHIBIT 5

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Paper 129
Entered: June 13, 2023

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

PATENT QUALITY ASSURANCE, LLC, and
INTEL CORPORATION,
Petitioner,

v.

VLSI TECHNOLOGY LLC,
Patent Owner.

IPR2021-01229*
Patent 7,523,373 B2

Before THOMAS L. GIANNETTI, BRIAN J. MCNAMARA, and JASON W. MELVIN, *Administrative Patent Judges*.

MELVIN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

* Intel Corporation, which filed a petition in IPR2022-00479, has been joined as a party to this proceeding.

I. INTRODUCTION

Patent Quality Assurance, LLC ("PQA") filed a Petition (Paper 1, "Pet.") requesting institution of *inter partes* review of claims 1–16 (all claims, or "the challenged claims") of U.S. Patent No. 7,523,373 B2 (Ex. 1001, "the '373 patent"), owned by VLSI Technology LLC ("Patent Owner").

After preliminary briefing, we instituted review. Paper 10 ("Institution Decision" or "Inst."). Following institution, Intel Corporation filed a petition for *inter partes* review and a Motion for Joinder in IPR2022-00479, requesting that Intel be joined as a petitioner to this proceeding. IPR2022-00479, Papers 3, 4. We instituted trial in IPR2022-00479, granted the Motion for Joinder, and added Intel as a petitioner here. *Id.*, Paper 13. A copy of that decision was entered into the record of this proceeding. Paper 30. Thus, PQA and Intel are, collectively, "Petitioner" here.

Patent Owner filed a Response (Paper 28 ("PO Resp.")), Petitioner filed a Reply (Paper 45 ("Pet. Reply")), and Patent Owner filed a Sur-Reply (Paper 89 ("PO Sur-Reply")). We held oral argument on October 26, 2022. Paper 126 ("Tr.").

We have jurisdiction under 35 U.S.C. § 6(b). This is a Final Written Decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons set forth below, we find Petitioner has demonstrated by a preponderance of evidence that the challenged claims are unpatentable.

A. Related Matters

The parties both identify the following matters related to the '373 patent: *VLSI Technology LLC v. Intel Corporation*, No. 1:19-cv-00254-ADA (consolidated as 1:19-cv-00977) (W.D. Tex.) (trial concluded with jury

verdict); and *OpenSky Industries, LLC v. VLSI Tech. LLC*, IPR2021-01056. Pet. 75; Paper 4.

Patent Owner identifies the following additional matters: *VLSI Tech. LLC v. Intel Corp.*, No. 6:21-cv-00057 (W.D. Tex.); *VLSI Tech. LLC v. Intel Corp.*, No. 6:21-cv-00299 (W.D. Tex.); and *Intel Corp. v. VLSI Tech. LLC*, IPR2020-00158 (PTAB) (on appeal to Federal Circuit, No. 21-1616). Paper 4.

B. REAL PARTIES IN INTEREST

Petitioner PQA identifies only itself as the real party in interest. Pet. 75. Petitioner Intel also identifies only itself as the real party in interest. IPR2022-00479, Paper 3, 1. Patent Owner identifies VLSI Technology LLC and CF VLSI Holdings LLC as real parties in interest. Paper 4.

C. THE '373 PATENT

The '373 patent is titled Minimum Memory Operating Voltage Technique. Ex. 1001, code (54). It describes a method of determining the minimum operating voltage for integrated-circuit memory, storing the value of that voltage in nonvolatile memory, and using the value to determine when an alternative power-supply voltage may be switched to the memory or ensuring that the minimum operating voltage is otherwise met. *Id.*, code (57).

The '373 patent's Figure 1 is reproduced below. *Id.*, Fig. 1.

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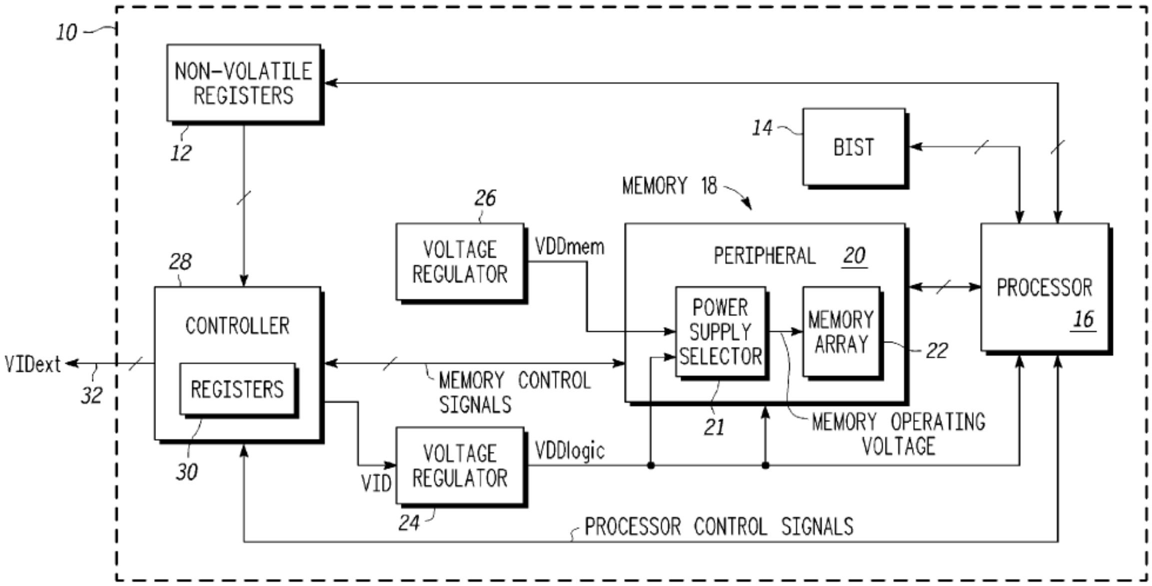

FIG. 1

Figure 1 depicts data processing system 10 including processor 16, voltage regulators 24 and 26, and memory 18 that includes power supply selector 21. *Id.* at 2:38–57. The system may adjust voltage regulator 24 such that "VDDlogic is scalable." *Id.* at 3:23–27; *see also id.* at 5:61–67 ("VDDmem may also be scalable"). Power supply selector 21 "selects one of VDDmem and VDDlogic and provides one of these to memory array 22 as the memory operating voltage." *Id.* at 2:52–55.

The '373 patent describes that various thresholds may be used for switching the memory's operating voltage from VDDlogic to VDDmem and that additional voltages may be provided to the memory using an additional voltage regulator. *Id.* at 3:54–67. For example, power supply selector 21 may switch the memory's power supply based on the minimum memory operating voltage required for reads, the minimum operating voltage required for writes, the minimum data retention voltage, or variations of those that depend on the memory's operating condition. *Id.* at 3:30–5:40.

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The patent describes built-in test (BIST) circuitry 14, which may be used to determine the various minimum operating voltages, which are then stored in nonvolatile memory. *Id.* at 2:40–41, 6:22–46; *see also id.* at 6:47–8:15.

D. CHALLENGED CLAIMS

Challenged claim 1 is reproduced below:

1. A method, comprising:

[a] providing an integrated circuit with a memory;

[b] operating the memory with an operating voltage;

[c] determining a value of a minimum operating voltage of the memory;

[d.1] providing a non-volatile memory (NVM) location;

[d.2] storing the value of the minimum operating voltage of the memory in the NVM location;

[e] providing a functional circuit on the integrated circuit exclusive of the memory;

[f] providing a first regulated voltage to the functional circuit;

[g] providing a second regulated voltage, the second regulated voltage is greater than the first regulated voltage;

[h] providing the first regulated voltage as the operating voltage of the memory when the first regulated voltage is at least the value of the minimum operating voltage; and

[i] providing the second regulated voltage as the operating voltage of the memory when the first regulated voltage is less than the value of the minimum operating voltage,

[j] wherein while the second regulated voltage is provided as the operating voltage of the memory, the first regulated voltage is provided to the functional circuit.

Ex. 1001, 13:7–28.[1] Claims 9 and 16 are independent and recite limitations similar to claim 1's. *Id.* at 13:59–14:15, 14:40–62. Claims 2–8 each depend from claim 1; claims 10–15 depend, directly or indirectly, from claim 9. *Id.* at 13:29–14:39.

E. PRIOR ART AND ASSERTED GROUNDS

Petitioner asserts the following grounds of unpatentability:

Claim(s) Challenged	35 U.S.C. §	References/Basis
1–7, 9–11, 13–16	103	Harris,[2] Abadeer,[3] Zhang[4]
2, 11, 12	103	Harris, Abadeer, Zhang, Cornwell[5]
8	103	Harris, Abadeer, Zhang, Bilak[6]

Pet. 2. Petitioner relies also on the Declarations of Adit Singh, Ph.D. (Ex. 1002; Ex. 1040) and the Declaration of Sylvia D. Hall-Ellis, Ph.D. (Ex. 1027).

II. ANALYSIS

A. CLAIM CONSTRUCTION

Petitioner contends that no claim requires construction other than claim 14, which recites a "means for providing the operating voltage to the memory at a value at least as great as the minimum operating voltage in response to the operating value selected by the processor being below the

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[1] Our bracketed designations for limitations largely follow those used by the parties. *See* Pet. 25–46.
[2] US 5,867,719, issued Feb. 2, 1999 (Ex. 1003).
[3] US 2006/0259840 A1, published Nov. 16, 2006 (Ex. 1004).
[4] US 2003/0122429 A1, published July 3, 2003 (Ex. 1005).
[5] US 7,702,935 B2, issued Apr. 20, 2010 (Ex. 1006).
[6] US 2005/0188230 A1, published Aug. 25, 2005 (Ex. 1007).

minimum operating voltage." Pet. 24, 64; Ex. 1001, 14:31–37. Petitioner points out that a district court construed the term as a means-plus-function term under 35 U.S.C. § 112, sixth paragraph, with the claimed function and a corresponding structure of the "power supply selector." *Id.* at 64 (quoting Ex. 1028, 2). Patent Owner does not challenge or otherwise address that construction, and we apply it in this decision.

B. UNPATENTABILITY OVER HARRIS, ABADEER, AND ZHANG

Petitioner submits that claim 1 would have been obvious over Harris, Abadeer, and Zhang. Pet. 25–46. Petitioner relies on Harris for a system with switchable voltages provided to memory and other systems in an integrated circuit. *Id.*

Harris discloses a system for permitting "soft defect detection testing (SDDT)" of a memory array in a data processor. Ex. 1003, code (57). Harris's Figure 1 is reproduced below. *Id.*, Fig. 1.

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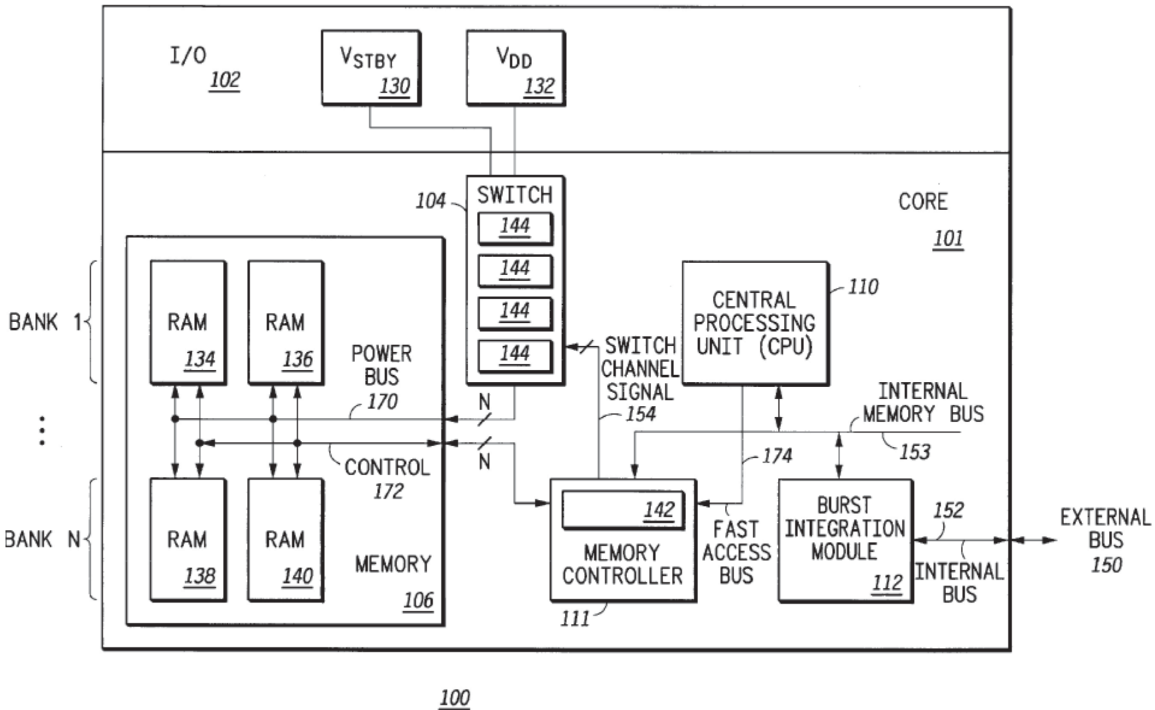

FIG.1

Figure 1 depicts data processor 100 with core 101 including memory portion 106 and switch circuit 104 with a plurality of switches 144 that couple two power-supply terminals in I/O section 102, Vstby 130 and VDD 132, to power bus 170 providing power to memory portion 106. *Id.* at 2:27–67.

Harris states that, "[i]n a normal mode of operation, the core 101 would be powered by a supply voltage applied to VDD terminal 132." *Id.* at 3:1–2. It then describes the SDDT operation, in which CPU 110 writes to register 142 in memory controller 111, causing switch 104 to power a portion of memory 106 from the Vstby terminal rather than the VDD terminal. *Id.* at 3:10–36. When so powered, an external circuit that applies power to the Vstby terminal may measure the current drawn by the portion

of memory powered by Vstby, detecting whether that portion has a defect. *Id.* at 3:36–49.

Harris describes that "the Vstby pin has a hardware controlled function as well," which is "the normal standby voltage function of the Vstby pin." *Id.* at 3:50–54. The parties refer to this as Harris's failure mode. For the failure-mode function, "the voltage level on the terminal VDD 132 is monitored to ensure that a functional voltage is provided." *Id.* at 3:54–56. "When this VDD voltage level drops below a set level or threshold, the voltage on the Vstby terminal 132 is switched to power the memory 106 to sustain memory contents when either main or VDD power is failing." *Id.* at 3:57–60. Thus, the memory contents are preserved by switching the memory to a power supply of sufficient voltage (Vstby) when the main supply (VDD) drops below the threshold level.

Harris further describes a low-power feature:

> [T]he test mode of the data processor . . . taught herein may be used as a low power feature wherein the second power supply voltage (Vstby or Vdd) is provided to the at least one memory array while the first power supply voltage (Vdd or Vstby) which is being supplied to the CPU is lowered so that lower power is consumed in the data processor while data within the at least one memory array is maintained.

Id. at 4:64–5:4.

Petitioner asserts that Abadeer discloses determining a memory's minimum operating voltage and storing that voltage's value in nonvolatile memory. Pet. 15–19, 27–30. Abadeer discloses "[a] solution for determining minimum operating voltages due to performance/power requirements." Ex. 1004, code (57). It states that its method applies to determining a minimum operating voltage for a "voltage island," in an integrated circuit,

such as a memory array. *Id.* ¶ 12. By that method, Abadeer aims to reduce power consumption in semiconductor circuits. *Id.* ¶ 13. Once a minimum operating voltage is determined in Abadeer, it is stored in nonvolatile memory. *Id.* ¶¶ 44–45.

Petitioner submits that skilled artisans had reason to use those teachings from Abadeer with Harris's system because (1) Harris teaches memory loss may occur below a threshold voltage and switching power supplies to prevent such losses, but does not teach how to determine that threshold; (2) Abadeer teaches a method for determining a memory's minimum operating threshold; (3) both Harris and Abadeer teach reducing a circuit's power consumption while maintaining a threshold voltage for memory in the circuit; and (4) Harris's and Abadeer's teachings are compatible, and Abadeer's technique would have predictably applied to Harris's system. *Id.* at 30–33.

Petitioner asserts that Zhang discloses voltage regulators applicable to Harris's system. Pet. 19–21, 36. Zhang discloses a system including "one or more integrated voltage regulators powered by an external voltage regulator and generating one or more local supply voltages for [a] processor." Ex. 1005, code (57); *see also id.* ¶¶ 18–31.

Petitioner submits that skilled artisans would have had reason to use Zhang's voltage regulators to supply the voltages for Harris's circuit. Pet. 35–40. Petitioner asserts that skilled artisans would have done so to (1) provide stable, precise supply voltages to Harris's system; (2) decrease power consumption when implementing Harris's low-power feature by making the supply voltages adjustable; and (3) predictably gain Zhang's benefits of adjustable supply voltages in Harris's system. *Id.* at 37–39.

1. <u>Harris's three operational modes are compatible with Abadeer</u>

Patent Owner contends that Harris describes a circuit that could not accommodate Abadeer's "minimum operating voltage" as a threshold for switching power supplies. PO Resp. 3–14. Patent Owner argues that the Institution Decision established that Harris's "'low power feature' must be compatible with the 'failure mode.'" *Id.* at 11 (citing Inst. 21); *accord id.* at 3–4. That misinterprets the Institution Decision, which stated that Harris's "three operating modes (SDDT, power failure, and low power) all arise from and relate to the same underlying hardware system." Inst. 21. That statement does not require all three modes be available in a particular implementation, only that all three use the same hardware system.

This distinction is particularly significant because Harris describes that its low-power feature is realized by using "the test mode." Ex. 1003, 4:64–65. The test mode uses a software-selected switch that allows the CPU to write to a register to control which power supply is provided to the memory. *Id.* at 3:9–18, 3:50–51. Thus, Harris describes that the low-power feature uses a software-defined switching threshold, and nothing about that threshold requires that it be the same as the threshold used for the failure mode. The failure mode, in contrast, is "a hardware controlled function" that monitors the voltage on the VDD terminal, and when that voltage "drops below a set level or threshold, the voltage on the Vstby terminal 132 is switched to power the memory 105 to sustain memory contents when either main or VDD power is failing." *Id.* at 3:52–60.

Accordingly, we do not agree with Patent Owner that "Harris's system cannot use a threshold [for its low-power feature] lower than the power-failure detection threshold." PO Resp. 11–12 (emphasis omitted). The

two aspects use different mechanisms to control which power supply is provided to the memory. Relatedly, Patent Owner asserts that Petitioner fails to justify "why a POSITA would have been motivated to abandon the 'failure mode' in favor of pursuing the specific 'low power feature.'" *Id.* at 14. Because Harris's failure mode and low-power feature are distinct aspects of Harris's operation, however, there would have been no need for skilled artisans to abandon one in favor of the other. In that regard, we credit Dr. Singh's testimony that because Harris's circuitry can be used for multiple functions, skilled artisans would have understood "how the operation of the circuitry would have been configured differently for those different functions or operations." Ex. 1040 ¶ 9.

Patent Owner argues additionally that, even if the low-power feature is distinct from the failure mode, Petitioner has not justified using the failure mode's "set level or threshold" with a different threshold for the low-power feature. PO Resp. 13–14. But that argument ignores that the low-power feature uses software to control the switch, rather than the hardware-controlled failure mode, as described above. Because the low-power feature and failure mode are based on different controlling mechanisms, Harris already describes using different thresholds for switching the memory's power supply in the two instances. And as Dr. Singh testifies, achieving the desired power savings or low-power operating parameters would have motivated skilled artisans to select a specific minimum operating voltage for the low-power feature. Ex. 1040 ¶ 9.

2. *A failing voltage is not "regulated"*

Patent Owner argues that, when Harris's failure mode is triggered such that the system switches the memory's power supply from VDD to

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Vstby, the system would no longer provide the first regulated voltage (VDD) to the functional circuit (i.e., Harris's CPU) while providing Vstby to the memory. PO Resp. 14–17. We agree and do not rely on Harris's failure mode for unpatentability.

3. *Harris's use of "while" is consistent with the claim language requiring switching "when" voltage drops*

The claim language requires providing the memory with the first regulated voltage when it is at least the memory's minimum operating voltage, and providing the memory with the second regulated voltage when the first voltage is less than the memory's minimum operating voltage. Patent Owner summarizes that as "the voltage received by the memory is dictated by" the first regulated voltage. PO Resp. 17. Patent Owner argues that Harris's low-power feature does not follow that relationship because it discloses providing the memory with the second voltage "while the first power supply voltage . . . is lowered." *Id.* at 18 (quoting Ex. 1003, 4:65–5:4); *accord id.* ("Harris's memory is already receiving the second voltage '***while***' the first voltage is being lowered.").

We do not agree. Primarily, Harris's description of the low-power feature does not restrict the feature to a particular timing for switching the memory's power supply. Instead, Harris uses "while" as a term of contrast—the memory receives the second power supply voltage, in contrast to the CPU, which receives the first power supply voltage. Ex. 1003, 4:66–5:2. Although Harris does not limit the low-power feature's switching methodology, Petitioner explains that because Harris separately describes threshold-based voltage switching (in connection with the failure mode), implementing the claimed threshold-based switching in connection with the

low-power mode would have involved using that known technique to achieve a predictable result (avoiding memory data loss). Pet. 32–33 (citing Ex. 1002 ¶ 76).

We agree, and find that skilled artisans would have had reason to and would have known how to implement Harris's low-power feature with the threshold-based switching described in Harris's failure mode.

4. *Skilled artisans had reason to add Zhang's voltage regulators to Harris's voltage supplies*

The claim language requires providing a first regulated voltage to the functional circuit (i.e., the CPU), and providing a second regulated voltage that is greater than the first regulated voltage. That second regulated voltage is provided to the memory when the first regulated voltage is less than the memory's minimum operating voltage.

Petitioner reasons that because Harris discloses lowering the voltage provided to its CPU, skilled artisans would have understood that Harris's circuit implemented voltage scaling—an adjustable voltage—using a voltage regulator with a controllable output. Pet. 35–36 (citing Ex. 1002 ¶ 81). Petitioner further reasons that skilled artisans would have incorporated Zhang's teachings for providing a regulated voltage to a functional circuit. *Id.* at 36–40. For the same reasons, Petitioner submits skilled artisans would have been motivated to add Zhang's voltage regulator to Harris's Vstby input also. Pet. 42–43.

Petitioner submits that skilled artisans would have incorporated Zhang's voltage regulators on Harris's VDD and Vstby inputs "to provide a stable voltage" (Pet. 37 (citing Ex. 1002 ¶ 84)) and "to permit independent voltage control and to manage power in low power operation" (*id.* at 39

(citing Ex. 1002 ¶ 85)). As to managing power in low-power operation, Petitioner points out that Harris discloses that either voltage (VDD or Vstby) may be lowered. *Id.* at 38 (citing Ex. 1003, 4:63–5:4). Petitioner further reasons that using Zhang's regulators for Harris's VDD and Vstby inputs would have been nothing more than using Zhang's known elements in Harris's known system according to Zhang's known methods, with predictable results. *Id.* at 39.

Patent Owner challenges whether skilled artisans would have had reason to regulate Harris's Vstby power supply voltage. PO Resp. 19–32. First, Patent Owner argues that because Zhang discloses adjustable regulators, there would have been no need to use Harris's switching mechanism to switch power supplies rather than "simply adopting Zhang's solution" to adjust independent power supplies. *Id.* at 21–24. That argument is inapposite because existence of an alternative approach does not undermine Petitioner's combination. *Intel Corp. v. Qualcomm Inc.*, No. 2020-2092, 2022 WL 880681, at *4 (Fed. Cir. Mar. 24, 2022) (holding a petitioner is "required to show only that 'there is something in the prior art as a whole to suggest the *desirability* . . . of making the combination, not whether there is something in the prior art as a whole to suggest that the combination is the *most desirable* combination available.'" (quoting *In re Fulton*, 391 F.3d 1195, 1200 (Fed. Cir. 2004) (internal quotation omitted)).

Next, Patent Owner argues that Harris's battery-powered Vstby supply has no need for regulation because a battery already provides a sufficiently stable voltage source. *Id.* at 24–26. Harris states that "[n]ormally, Vstby will be powered from a battery back-up source."

Ex. 1003, 3:60–61.[7] While Patent Owner contends we should interpret Harris's statement to mean Vstby is powered from a battery when not used for Harris's soft-defect-test functionality (PO Sur-Reply 4), we do not agree. In our view, Harris's statement supports Petitioner's view that a battery need not be used in all scenarios, and Vstby could be powered from a non-battery source. *See* Pet. Reply 12 (citing Ex. 1040 ¶ 14). Nothing about Harris's statement indicates it is drawing a contrast with the test functionality. Further, the sentence continues that Vstby "may or may not be a voltage equal to that supplied by VDD." Ex. 1003, 3:61–62. That nonlimiting disclosure regarding voltage supports that Vstby could be provided by a source other than a battery. And in such a case, adding a regulator would benefit the power supply's stability as Petitioner asserts. *See* Pet. 37.

The parties dispute also whether Harris discloses adjusting the voltage of Vstby in addition to VDD. Petitioner relies on Harris's description of its "low power feature wherein the second power supply voltage (Vstby or Vdd) is provided to the at least one memory array while the first power supply voltage (Vdd or Vstby) which is being supplied to the CPU is lowered." Ex. 1003, 4:65–5:2. That description indicates that either supply may be provided to the CPU, and either may be provided to the memory. If the system provides power from Vstby to the CPU, then lowering the

[7] Patent Owner relies also on Dr. Singh's testimony that Harris's "standby voltage will be designed to be as robust as possible, including battery backup." Ex. 2053, 123:4–15. We do not agree that testimony establishes that Harris requires a battery in all implementations. Rather, Harris's nonlimiting language discussed above is more persuasive that Harris's battery is a preferred embodiment.

voltage provided to the CPU requires a way to adjust the Vstby voltage. Petitioner reasons that this need for voltage scaling would have motivated skilled artisans to include Zhang's adjustable voltage regulator in Harris's circuit for *both* VDD and Vstby. Pet. 35–36, 38–39, 42; Pet. Reply 10–11, 12, 14. Patent Owner disputes this, arguing that Harris never discloses providing Vstby to the CPU and therefore does not support a need for voltage scaling on Vstby. PO Sur-Reply 5; Tr. 43:8–46:4. Although Patent Owner recognizes that Harris discloses the interchangeability of its power supplies when lowering the CPU's voltage, Patent Owner contends that is a mistake "because the hardware of Harris is not designed for Vstby to power the CPU." Tr. 45:17–46:4.

Harris twice discloses the interchangeability of its power-supply inputs when discussing the low-power feature. Ex. 1003, 4:66–5:2. And that ability is consistent with Harris's description that "switch control signal 154 is software controlled or software programmable and is used to set a configuration of the switches 144 to control power supply distribution in the data processor 100." *Id.* at 2:47–52. That description indicates that switch 104 (which contains switches 144) controls power supply distribution in data processor 100 as a whole, not just for memory 106. Harris, however, does not depict the power supply connection from switch 104 to CPU 110, and Figure 2 shows a detailed view of switch 104 that does not include any output for CPU 100. *Id.*, Fig. 2. We read Harris's disclosure of its low-power feature as indicating a flexibility in the design that is consistent with the earlier description that switch 104 controls power supply distribution generally. Because Harris's core functionality does not require power supply interchangeability, there was no need for Harris to detail circuitry capable of

that. But that does not mean Harris's description of the interchangeability was a mistake.[8] While the issue is not determinative because we rely on Petitioner's other arguments that skilled artisans would have included Zhang's regulator on Vstby, we determine the record supports Petitioner's view that skilled artisans had reason to make Vstby scalable.

Additionally, Petitioner's contention that skilled artisans had reason to add Zhang's regulator to Harris's Vstby input does not depend on a non-battery Vstby supply. As the Petition contended, using a voltage regulator would provide a stable voltage. Pet. 37. Although Patent Owner argues that a battery already provides a stable voltage (PO Resp. 24–25), a voltage regulator would stabilize the battery's voltage as it neared discharge. *See* Pet. Reply 12. Dr. Singh's testimony supports that view, recognizing that Harris's reference to "a battery back-up source" indicates accompanying circuitry to condition and regulate the battery's voltage. Ex. 1040 ¶ 13. Stated otherwise, a battery alone does not necessarily provide an optimum power supply, and adding Zhang's voltage regulator as Petitioner asserts would offer a benefit to Harris's circuit.

Thus, we agree that skilled artisans had reason to add a voltage regulator to Harris's Vstby input to ensure a stable voltage for the memory during low-power operation. Patent Owner argues that including such a regulator would cost more in power dissipation than it would extend the battery life (PO Resp. 31–32), but we credit Dr. Singh's testimony that even

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[8] Harris claims embodiments in which the first power supply voltage (claim 6) and the second power supply voltage (claim 7) may be lowered, supporting that Harris desires voltage scaling for both of its power supplies. Ex. 1003, 5:58–6:5.

with a voltage regulator's non-zero resistance, including the regulator would extend the usable battery life, particularly because the regulator would have been able to boost the battery's voltage at the end of its life. Ex. 1040 ¶ 16.

Patent Owner argues also that using a voltage regulator on Harris's Vstby input would compromise Harris's primary SDDT functionality. PO Resp. 27–30. Petitioner disputes that argument, submitting that the added voltage regulation would still permit detection of elevated current draws. Pet. Reply 12. We credit Dr. Singh's testimony that any higher current draw by the memory would result in higher current draw by the voltage regulator, permitting the testing as Harris intends. Ex. 1040 ¶ 15. Thus, although the added regulator may have an effect on SDDT, the record supports that the regulator would provide a benefit to low-power functionality without undermining SDDT.

Patent Owner argues also that using Zhang's regulators would undermine Harris's principle of operation by requiring design iterations to calibrate the on-chip regulators. PO Resp. 33–34. Harris sought to reduce iterations required during a circuit's design cycle by eliminating on-board test circuitry and providing a way for the circuit to use external test circuitry. Ex. 1003, 1:36–52. Dr. Singh agreed that present approaches to circuit design often require two or three iterations. Ex. 2053, 80:22–24. Patent Owner asserts that testimony shows that adding Zhang's regulators to Harris would undermine the goal of reducing design iterations, but Dr. Singh noted that "power supply specifications" implicating a voltage regulator are only one possible reason for design iterations and that "there are lots of other issues going on." *Id.* at 80:24–25; *see id.* at 79:17–80:25. We conclude that the record does not show that adding Zhang's voltage regulators would

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interfere with Harris's principle of operation. As discussed above, the regulators would not prevent Harris's primary SDDT functionality. Harris's goal of reducing design iterations does not implicate its principle of operation, and even if adding Zhang's regulators would have added rather than reduced design iterations, we do not view it as rising to a level that would undermine the combination. *See Medichem S.A. v. Rolabo S.L.,* 437 F.3d 1157, 1165 (Fed. Cir. 2006) ("The fact that the motivating benefit comes at the expense of another benefit, however, should not nullify its use as a basis to modify the disclosure of one reference with the teachings of another. Instead, the benefits, both lost and gained, should be weighed against one another." (quoting *Winner Int'l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 n.8 (Fed. Cir. 2000))).

Finally, Patent Owner contends that Zhang's regulators require a stable reference to themselves regulate a voltage. PO Resp. 34–35. Thus, reasons Patent Owner, Harris's circuit would still need a stable, external voltage, eliminating any benefit from adding Zhang's regulators. *Id.* That argument, however, ignores Harris's desire for adjustable voltages. As discussed above, at least Harris's VDD (and in our view Vstby also) must be adjustable for the low-power feature, and Zhang's adjustable regulators provide that functionality.

For the reasons discussed, the record supports that adding Zhang's regulator to Harris's Vstby would provide a benefit, whether or not using a battery for Vstby and whether or not Harris supports scaling Vstby, and that skilled artisans therefore had reason to make the asserted combination, notwithstanding some potential drawbacks.

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5. Using Abadeer's nonvolatile storage would not have undermined Harris's principle of operation

Abadeer discloses a "Built-In-Self-Test (BIST) circuit . . . used to determine the correct supply voltage for all elements in a design." Ex. 1004 ¶ 14. Once Abadeer's circuit uses BIST to determine the minimum operating voltages, those values are "stored in a non-volatile memory (such as fuses)." *Id.* ¶ 45. Petitioner reasons that, in the combination, skilled artisans would have incorporated Abadeer's nonvolatile memory to store minimum operating voltages to reduce the need to run the self-test and speed startup after a power cycle. Pet. 34 (citing Ex. 1002 ¶ 78).

Patent Owner contends that including nonvolatile memory would have disrupted Harris's principle of operation. PO Resp. 36–39. Because Harris uses SRAM, which was a type of memory that was a common alternative to nonvolatile memory, Patent Owner contends Harris "was designed to avoid such [nonvolatile] memory." *Id.* at 37. In Patent Owner's view, using Abadeer's BIST to determine the minimum operating voltage during each power cycle "would have been preferable." *Id.* But there is no requirement that an asserted "combination is the *best* option, only that it be a *suitable* option." *Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1380 (Fed. Cir. 2023). We do not agree with Patent Owner that Harris's principle of operation included avoiding nonvolatile memory. Petitioner provides a persuasive reason that skilled artisans would have used Abadeer's approach for storing determined minimum operating voltages in nonvolatile memory added to Harris's system.

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6. *Objective indicia of nonobviousness*

Despite Patent Owner not asserting objective indicia of nonobviousness in the Response, Petitioner asserts that the jury verdict of infringement by Intel does not weigh against obviousness. Pet. Reply 23–25. Patent Owner disputes that and contends the jury's infringement verdict shows commercial success. PO Sur-Reply 19–20; *see* Ex. 1031, 2, 6.

As an initial matter, we determine that Patent Owner waived reliance on secondary considerations by failing to raise them in the Response. *See* Paper 15, 9 ("Patent Owner is cautioned that any arguments not raised in the response may be deemed waived."); *In re NuVasive, Inc.*, 842 F.3d 1376, 1380–81 (Fed. Cir. 2016); Consolidated Trial Practice Guide 52 (Nov. 2019), *available at* https://www.uspto.gov/TrialPracticeGuideConsolidated. Even considering Patent Owner's purported reliance, however, it is not persuasive.

To establish a nexus between Patent Owner's alleged commercial success and the '373 patent's claims, Patent Owner asserts that the jury was "charged with determining damages based upon the value of the technology captured by the claims." PO Sur-Reply 20 n.2 (citing Ex. 2021, 1545:13–1546:9).

When the evidence shows that a product includes "the invention disclosed and claimed in the patent," we presume that any commercial success of the product is due to the patented invention. *PPC Broadband v. Corning Optical Commc'ns,* 815 F. 3d 734, 746–747 (Fed. Cir. 2016). Such a presumed nexus requires not only that a commercial product embodies the claims, but also that it is coextensive with them. *See Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019) ("[P]resuming nexus is

appropriate 'when the patentee shows that the asserted objective evidence is tied to a specific product and that product embodies the claimed features, and is coextensive with them.'" (quoting *Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1072 (Fed. Cir. 2018))).

Petitioner notes that the jury infringement verdict is on appeal. Pet. Reply 23. According to Petitioner, Patent Owner fails to show the verdict demonstrates commercial success with a nexus to the challenged claims. *Id.* at 24. Petitioner argues that the challenged claims were not the basis for customer demand of the accused products. *Id.* (citing Ex. 1044, 811:13–812:24 (Intel employee Adam King testifying that Intel's customers care about numerous technical attributes, including graphics performance for video editing, camera quality for video conferencing and power efficiency for laptops)). Petitioner notes that Patent Owner accused only the "C6 SRAM multiplexer" feature of infringing the '373 patent (Ex. 1042, 453:20–25; Ex. 1044, 815:16–816:21) and that Patent Owner's damages expert, Dr. Sullivan, "conceded that many of the thousands of other features 'have nothing to do with what [Patent Owner] accuses.'" Pet. Reply 24 (quoting Ex. 1043, 690:19–691:24).

The record before us does not show that Intel's product or products underlying the infringement verdict are coextensive with "the invention disclosed and claimed." *See Fox Factory*, 944 F.3d at 1373, 1377; *Facebook, Inc. v. Express Mobile Inc.*, IPR2021-01457, Paper 38 at 76–80 (PTAB Mar. 14, 2023) (concluding an infringement verdict was insufficient to establish nexus). Rather, the record shows that the accused products contained many features beyond those claimed in the '373 patent. Ex. 1043, 690:19–691:24; Ex. 1044, 815:16–816:21. That evidence persuades us that,

regardless of a presumed nexus, the commercial success does not have a nexus with the challenged claims.

Additionally, other than the jury verdict, Patent Owner has not provided financial information that would allow us to weigh the extent of Intel's infringing sales in the market. In particular, the record does not reflect whether the infringing devices represented an increase in market share over prior, noninfringing devices or any other aspect that would allow us to place the verdict's amount in context. *See, e.g.*, *In re Applied Materials, Inc.*, 692 F.3d 1289, 1300 (Fed. Cir. 2012) ("An important component of the commercial success inquiry in the present case is determining whether Applied had a significant market share."). On this record, even considering the waived issue, we find the evidence of commercial success is weak evidence of non-obviousness.

7. Harris is available as prior art

Patent Owner argues that Harris is nonanalogous art to the '373 patent and therefore cannot be used in an obviousness combination. PO Resp. 39–52. To be analogous art, Harris must be in the same field of endeavor as the '373 patent or be reasonably pertinent to the problem addressed by the '373 patent. *In re Clay*, 966 F.2d 656, 658–59 (Fed. Cir. 1992).

Patent Owner contends that the '373 patent's field of endeavor is a "minimum memory operating voltage technique." PO Resp. 40–41 (citing Ex. 2052 ¶¶ 155–156). With that contention, Patent Owner contrasts Harris's field, which Patent Owner asserts as "soft-defect testing on-chip memory." *Id.* at 43 (citing Ex. 2052 ¶ 157).

Petitioner submits that Patent Owner improperly constrains the '373 patent's field of endeavor. Pet. Reply 16–17. According to Petitioner,

the ’373 patent’s field is “the design and operation of memories, including voltage supplies to those memories.” Pet. Reply 16 (citing Ex. 1040 ¶ 22). Petitioner points out that the ’373 patent describes related art as that making “tradeoffs between performance and power” by operating processors “at maximum voltage and frequency when peak performance is required” and “at low voltage and frequency to reduce power consumption” at other times. Pet. Reply 16 (quoting Ex. 1001, 1:12–25). Petitioner compares that to Harris, which “teach[es] circuit design and operation for processors and/or memory to manage power by adjusting voltage levels to components of an IC.” Pet. 39–40 (citing Ex. 1003, 4:63–5:4); Pet. Reply 17.

We agree with Petitioner. Both Harris and the ’373 patent are in the field of memory power supply. While Harris describes a voltage-supply system allowing for a particular testing approach, its field is not limited to its primary purpose of soft-defect testing on-chip memory. Rather, Harris also describes that its system allows other features such as failure protection and a low-power feature. Ex. 1003, 3:50–67, 5:59–5:4. Thus, we find that Harris’s field is memory power supply, and more specifically, switchable memory power supplies.

As discussed, the ’373 patent describes its related art as making tradeoffs between performance and power when choosing voltage and frequency for processors and memory. Ex. 1001, 1:12–25. While the ’373 patent describes determining the minimum operating voltage for each part and storing that determined value (*id.* at 2:3–37, 6:22–8:15), its disclosures are considerably broader in scope. The patent describes selecting memory voltage based on multiple considerations, such as using the logic voltage when it is higher than the memory minimum operating voltage, or a

variety of minimum voltages depending on operating circumstances. *Id.* at 3:30–5:41. As to the system controlling a memory's power supply, the '373 patent describes mechanisms that may be used to control a memory's power supply, such as power supply selector 21. *Id.* at 2:52–59, 5:42–58. It details operation of the power supply controller 28 and selector 21. *Id.* at 8:33–9:4. The '373 patent describes alternatively that memory may be permanently coupled to a particular voltage bus that is scaled to provide the desired power. *Id.* at 2:59–61, 5:61–67.

The disclosures regarding mechanisms for controlling the memory power supply show that the '373 patent's field is broader than just determining the minimum operating voltage. We find that the '373 patent's field includes switchable memory power supplies, supporting that Harris is from the same field as the '373 patent.

As to whether Harris is reasonably pertinent to the problem addressed by the '373 patent, Petitioner contends that the '373 patent addresses "lowering power consumption in integrated circuits, considering that 'different types of circuitry within a data processing system may have different ranges of allowable operating voltages' and that 'the processor may be able to operate at a lower voltage than is possible for the memory.'" Pet. Reply 19 (quoting Ex. 1001, 1:12–25, 2:5–7). Petitioner contends that Harris addresses the same problem with its circuit to "ensure the memory is provided with sufficient voltage to avoid data loss." Pet. 14–15 (citing Ex. 1003, 3:54–56, 3:64–67 (Harris's disclosure of switching memory power supply "to avoid memory data loss")).

Patent Owner's expert agrees that the '373 patent addresses "the problem of providing different voltages to different parts of the circuit" to

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accommodate different "allowable operating voltages." PO Resp. 49 (quoting Ex. 2052 ¶ 159). As discussed above, Harris discloses a mechanism for providing different voltages to different parts of its circuit, whether for testing or low-power operation. Ex. 1003, 3:50–67, 5:59–5:4. We find that Harris is reasonably pertinent to the problem of providing different voltages to different parts of the circuit. While the '373 patent addresses other problems also, that does not undermine the problem to which Harris is reasonably pertinent. *See Ethicon LLC v. Intuitive Surgical, Inc.*, No. 2021-1601, 2022 WL 1576779, at *4 (Fed. Cir. May 19, 2022) (nonprecedential) (holding that the patent owner's identification of an additional problem beyond that supporting analogous art was irrelevant); *Donner Tech., LLC v. Pro Stage Gear, LLC*, 979 F.3d 1353, 1361 (Fed. Cir. 2020) (noting the analysis considers "one or more problems to which the claimed invention relates").

Accordingly, Harris is analogous art to the '373 patent because it is both from the same field of endeavor and reasonably pertinent to a problem confronting the inventor of the '373 patent.

8. Abadeer is available as prior art

Patent Owner contends that Abadeer is not available as prior art in an *inter partes* review because section 311(b) of 35 U.S.C. limits *inter partes* reviews to "patents or printed publications," whereas Abadeer was neither as of the '373 patent's filing date. PO Resp. 53–58. In Patent Owner's view, an *inter partes* review may not consider a reference that, like Abadeer, was published after the challenged patent's filing date, notwithstanding 35 U.S.C. § 102(e). *Id.* at 55.

Section 311(b) provides that an *inter partes* review may assert "a ground that could be raised under section 102 or 103 and only on the basis of prior art consisting of patents or printed publications." 35 U.S.C. § 311(b). Pre-AIA section 102(e) provides for unpatentability based on "an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for" the challenged patent. 35 U.S.C. § 102(e)(1) (2006). Petitioner argues that section 311(b) thus applies to art, like Abadeer, that is a printed publication that can be raised under section 102(e). Pet. Reply 19–20.

We agree with Petitioner. The Federal Circuit held in *Purdue Pharma L.P. v. Iancu* that an asserted patent application published on December 12, 2002, *after* the August 6, 2002, effective priority date of a challenged patent, but filed on August 30, 2001, *before* the challenged patent's effective priority date, nonetheless qualified as prior art that could be used in an *inter partes* review based on its pre-AIA section 102(e) application filing date . *Purdue Pharma*, 767 F. App'x 918, 925 (Fed. Cir. 2019) (nonprecedential). While the court did not consider the specific argument raised here—that *inter partes* reviews categorically may not rely on patent applications published after the challenged patent's priority date—*Purdue Pharma* signals an endorsement of the ability to use such publications as section 102(e) art in *inter partes* reviews.

According published applications an effective date as of their filing, as defined by section 102(e)(1), is consistent with according patents an effective date as of their filing, as defined by section 102(e)(2). In *Becton, Dickinson & Co. v. Baxter Corp. Englewood*, 998 F.3d 1337 (Fed. Cir. 2021), the Federal Circuit held that section 102(e)(2) applied to a patent

that had been later canceled, making that former patent available as prior art in an *inter partes* review. *Becton, Dickinson*, 998 F.3d at 1345. In its decision, the Federal Circuit noted and rejected the patent owner's argument that a 102(e)(2) patent could not be considered a prior-art patent before the date it was actually made public, i.e., the date it issued. *Id.* at 1345 n.7. We do not agree with Patent Owner that *Becton, Dickinson* is irrelevant because it concerned an issued patent (PO Sur-Reply 23 n.5). Rather, it supports that *inter partes* reviews properly consider prior-art references with effective dates prior to their actual publication dates.

While Patent Owner argues that section 311's "patents or printed publications" does not encompass a published patent application that is prior art under section 102(e)(1), we do not agree. *See* PO Resp. 53–57. Patent Owner relies on case law holding that a "printed publication" under sections 102(a) and (b) must be publicly available as of the challenged patent's priority date, but as noted, Petitioner relies on Abadeer being a printed publication having an effective date determined by its filing date under section 102(e)(1) rather than its publication date. In our view, section 311's reference generally to section 102 indicates that applicable "printed publications" include published applications under section 102(e)(1).

9. Conclusion regarding claim 1

We have considered the full record, including evidence and arguments presented by Petitioner and Patent Owner on whether Harris, Abadeer, and Zhang teach or suggest claim 1's limitations, whether there was a reason that skilled artisans at the time would have combined Harris, Abadeer, and Zhang as asserted, and whether objective indicia indicate the claims would

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not have been obvious. Based on the full record, we conclude that Petitioner has shown by a preponderance of the evidence that claim 1 would have been obvious over Harris, Abadeer, and Zhang.

10. <u>Additional claims</u>

Petitioner provides contentions for claims 2–7, 9–11, and 13–16, generally relying on its contentions for claim 1, addressing differences in the language of independent claims 9 and 16, and identifying disclosures teaching the limitations of the dependent claims. Pet. 47–67. Other than as discussed above regarding claim 1, Patent Owner does not dispute Petitioner's contentions. We have reviewed the record, including Patent Owner's asserted objective indicia of nonobviousness, and determine that Petitioner has shown claims 2–7, 9–11, and 13–16 would have been obvious over Harris, Abadeer, and Zhang for the reasons discussed above, and because Petitioner has shown that the combination teaches all the limitations recited in claims 2–7, 9–11, and 13–16.

C. UNPATENTABILITY OVER HARRIS, ABADEER, ZHANG, AND CORNWELL

For claims 2, 11, and 12, which depend from claim 1 or claim 9, Petitioner relies on its contentions for claims 1 and 9, and further points to Cornwell's disclosures relevant to the limitations in claims 2, 11, and 12. Pet. 67–72. Other than as discussed above, Patent Owner does not challenge those contentions. We have reviewed Petitioner's contentions and determine Petitioner has shown claims 2, 11, and 12 would have been obvious over Harris, Abadeer, Zhang, and Cornwell for the reasons discussed above, and because Petitioner has shown that the combination teaches all the limitations recited in claims 2, 11, and 12 and has provided reasoning with a rational

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underpinning to explain why a person having ordinary skill in the art at the time of the invention would have combined the references as asserted.

D. UNPATENTABILITY OVER HARRIS, ABADEER, ZHANG, AND BILAK

For claim 8, which depends from claim 1, Petitioner relies on its contentions for claim 1, and further points to Bilak's disclosures relevant to claim 8's limitations. Pet. 72–74. Other than its arguments for the patentability of claim 1, Patent Owner does not challenge Petitioner's contentions for claim 8 or introduce secondary considerations evidence specific to claim 8. We have reviewed Petitioner's contentions and determine Petitioner has shown claim 8 would have been obvious over Harris, Abadeer, Zhang, and Bilak for the reasons discussed above, and because Petitioner has shown that the combination teaches all the limitations recited in claim 8 and has provided reasoning with a rational underpinning to explain why a person having ordinary skill in the art at the time of the invention would have combined the references as asserted.

E. CONSTITUTIONAL STANDING

Patent Owner argues that an *inter partes* review where the petitioner lacks constitutional injury-in-fact is unconstitutional. PO Resp. 58–62. We agree with Petitioner that Patent Owner's argument contradicts precedent. Pet. Reply 25; *Cuozzo Speed Techs., LLC v. Lee*, 579 U.S. 261, 279 (2016) ("Parties that initiate the proceeding need not have a concrete stake in the outcome; indeed, they may lack constitutional standing."); *Consumer Watchdog v. Wisconsin Alumni Rsch. Found.*, 753 F.3d 1258, 1261 (Fed. Cir. 2014) ("Article III standing is not necessarily a requirement to appear before an administrative agency . . . ."). We further agree that, because Intel

has been joined as a Petitioner, Patent Owner's argument does not apply to this proceeding. Pet. Reply 26.

III. CONCLUSION[9]

For the reasons discussed and based on the entire record, Petitioner has shown by a preponderance of the evidence that claims 1–16 are unpatentable.

In summary:

Claim(s)	**35 U.S.C. §**	**Reference(s)/Basis**	**Claim(s) Shown Unpatentable**	**Claim(s) Not Shown Unpatentable**
1–7, 9–11, 13–16	103	Harris, Abadeer, Zhang	1–7, 9–11, 13–16	
2, 11, 12	103	Harris, Abadeer, Zhang, Cornwell	2, 11, 12	
8	103	Harris, Abadeer, Zhang, Bilak	8	
Overall Outcome			1–16	

IV. ORDER

In consideration of the foregoing, it is hereby:

[9] Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. §§ 42.8(a)(3), (b)(2).

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Paper 129
Entered: June 13, 2023

ORDERED that Petitioner has shown by a preponderance of the evidence that claims 1–16 of the '373 patent are unpatentable;

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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EXHIBIT 6

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Paper 135
Entered: May 12, 2023

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION,
OPENSKY INDUSTRIES, LLC,
Petitioner,*

v.

VLSI TECHNOLOGY LLC,
Patent Owner.

IPR2021-01064
Patent 7,725,759 B2

Before THOMAS L. GIANNETTI, BRIAN J. MCNAMARA, and JASON W. MELVIN, *Administrative Patent Judges*.

MELVIN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)
Denying Patent Owner's Motion to Exclude
37 C.F.R. § 42.64

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* Intel Corporation, which filed a petition in IPR2022-00366, has been joined as a party to this proceeding. Paper 43.

I. INTRODUCTION

OpenSky Industries, LLC filed a Petition (Paper 2, "Pet.") requesting institution of *inter partes* review of claims 1, 14, 17, 18, 21, 22, and 24 ("the challenged claims") of U.S. Patent No. 7,725,759 B2 (Ex. 1001, "the '759 patent"), owned by VLSI Technology LLC ("Patent Owner").

After preliminary briefing, we instituted review. Paper 17 ("Institution Decision" or "Inst."). Following institution, Intel Corporation filed a petition for *inter partes* review and a Motion for Joinder in IPR2022-00366, requesting that Intel be joined as a petitioner to this proceeding. IPR2022-00366, Papers 3, 4. We instituted trial in IPR2022-00366, granted the Motion for Joinder, and added Intel as a petitioner here. *Id.*, Paper 14. A copy of that decision was entered into the record of this proceeding. Paper 43. Thus, OpenSky and Intel are, collectively, "Petitioner" here.

Patent Owner filed a Response (Paper 40 ("PO Resp.")), Petitioner filed a Reply (Paper 49 ("Pet. Reply")), and Patent Owner filed a Sur-Reply (Paper 85 ("PO Sur-Reply")). We held oral argument on September 22, 2022. Paper 105 ("Tr.").

Additionally, Patent Owner filed a Motion to Exclude two expert declarations filed by Petitioner. Paper 88 ("PO Mtn. Exclude"). Petitioner Opposed (Paper 94) and Patent Owner replied (Paper 95).

We have jurisdiction under 35 U.S.C. § 6(b). This is a Final Written Decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons set forth below, we find Petitioner has demonstrated by a preponderance of evidence that the challenged claims are unpatentable. We deny Patent Owner's Motion to Exclude.

A. Related Matters

The parties both identify the following matter related to the ’759 patent: *VLSI Technology LLC v. Intel Corporation*, No. 6:19-cv-00254-ADA (consolidated as 1:19-cv-00977) (W.D. Tex.) (trial concluded with jury verdict). Pet. 5; Paper 5. Patent Owner identifies the following additional matters: *VLSI Tech. LLC v. Intel Corp.*, No. 6:21-cv-00057 (W.D. Tex.); *VLSI Tech. LLC v. Intel Corp.*, No. 6:21-cv-00299 (W.D. Tex.); *Intel Corp. v. VLSI Tech. LLC*, IPR2020-00498 (PTAB) (on appeal to Federal Circuit, No. 21-1617); *Intel Corp. v. CLSI Tech. LLC*, IPR2020-00106 (PTAB) (on appeal to Federal Circuit, No. 21-1614). Paper 5.

B. Real Parties in Interest

Petitioner OpenSky identifies only itself as the real party in interest. Pet. 5. Petitioner Intel identifies only itself as the real party in interest. *See* Paper 42, 4. Patent Owner identifies VLSI Technology LLC and CF VLSI Holdings LLC as real parties in interest. Paper 5.

C. The ’759 Patent

The ’759 patent is titled “System and Method of Managing Clock Speed in an Electronic Device.” Ex. 1001, code (54). It describes a method of monitoring a plurality of master devices coupled to a bus, receiving an input from a master device that is a request to increase the bus clock frequency, and increasing the bus clock frequency in response to the request. *Id.*, code (57). The ’759 patent’s Figure 1 is reproduced below:

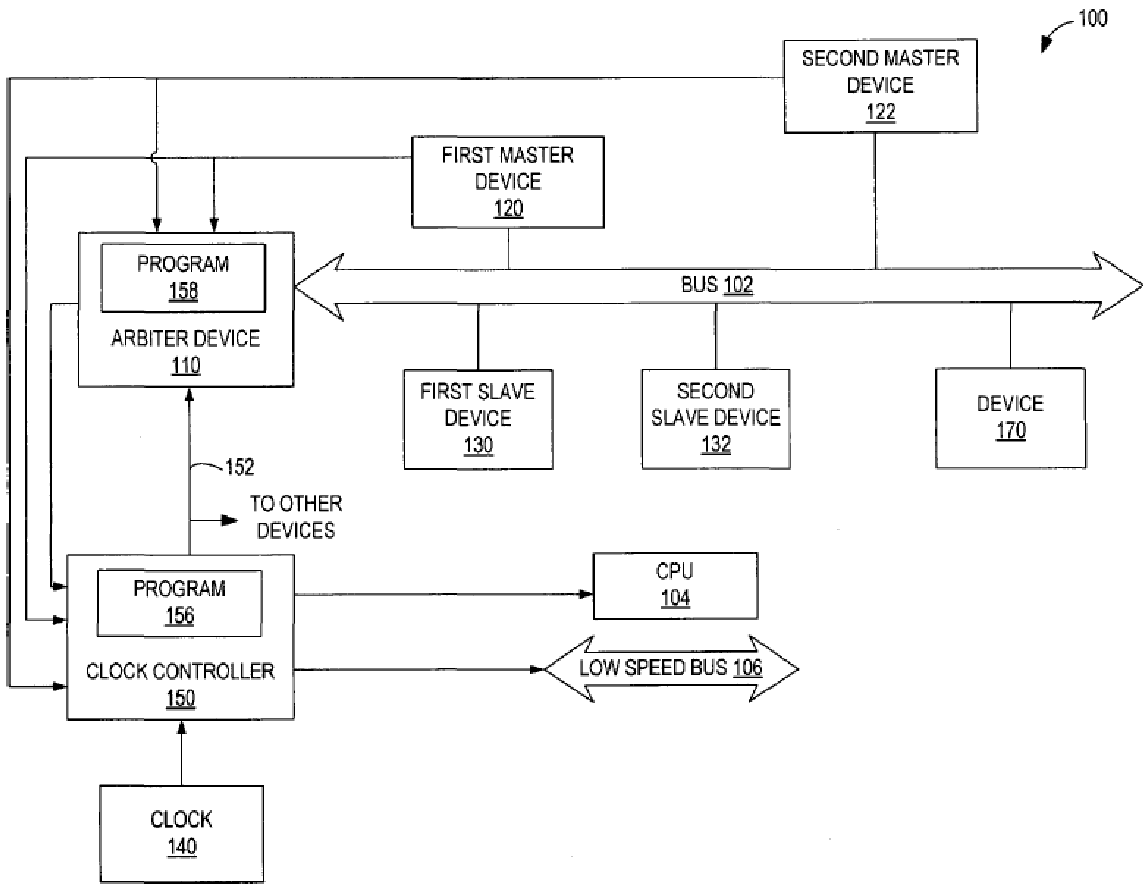

FIG. 1

Figure 1 is a block diagram depicting electronic system 100 with first master device 120 and second master device 122 coupled to bus 102, which is also coupled to arbiter 110. *Id.* at 2:58–3:3. Clock controller 150 is coupled to arbiter 110, clock 140, CPU 104, first master device 120, and second master device 122. *Id.* at 3:3–10.

The '759 patent describes that, in an illustrative embodiment, "clock controller 150 can output a high speed clock 152 having a variable clock frequency to the bus 102 via the arbiter 110 and another high speed clock output to the CPU 104." *Id.* at 3:32–35. Bus devices may generate trigger outputs indicating a request to change the high-speed clock frequency. *Id.* at 3:64–4:17. Then, "clock controller 150 controls and/or adjusts the high

speed clock 152 by changing the clock frequency in response to the plurality of trigger signal inputs." *Id.* at 4:22–24. The '759 patent also describes that, "[i]n a particular embodiment, the clock controller 150 may determine that a change in the high speed clock 152 may not be desired" and, would therefore not change the clock frequency. *Id.* at 4:58–62.

D. CHALLENGED CLAIMS

Challenged claim 1 is reproduced below:

> 1. A method, comprising:
>
> monitoring a plurality of master devices coupled to a bus;
>
> receiving a request, from a first master device of the plurality of master devices, to change a clock frequency of a high-speed clock, the request sent from the first master device in response to a predefined change in performance of the first master device, wherein the predefined change in performance is due to loading of the first master device as measured within a predefined time interval; and
>
> in response to receiving the request from the first master device:
>
> providing the clock frequency of the high-speed clock as an output to control a clock frequency of a second master device coupled to the bus; and
>
> providing the clock frequency of the high-speed clock as an output to control a clock frequency of the bus.

Ex. 1001, 7:66–8:15. Claims 14 and 18 are independent and recite limitations similar to claim 1. *Id.* at 8:50–9:4, 9:19–40. Each of the other challenged claims depends from one of the independent claims.

E. PRIOR ART AND ASSERTED GROUNDS

Petitioner asserts the following grounds of unpatentability:

Claim(s) Challenged	35 U.S.C. §	References/Basis
1, 14, 17	103	Shaffer[1], Lint[2]
18, 21, 22, 24	103	Shaffer, Lint, Kiriake[3]
1, 14, 17	103	Chen[4], Terrell[5]
18, 21, 22, 24	103	Chen, Terrell, Kiriake

Pet. 7. Petitioner relies also on the Declarations of Dr. Bruce Jacob. Exs. 1002, 1046, 1055.

II. ANALYSIS

A. CLAIM CONSTRUCTION

1. “request”

Petitioner proposes that we apply the plain and ordinary meaning to each term of the claims. Pet. 17. According to Patent Owner “[t]he plain meaning of ‘request’ is to ask for something.” PO Resp. 4. Patent Owner submits that Shaffer does not disclose the claimed “request” because a “request” does not encompass a command that mandates action, whereas Shaffer acts on the identified signals without assessment. *Id.* at 4–5, 9–14. Petitioner asserts that “nothing in the challenged claims excludes the scenario in which requests must be followed.” Reply 5. Thus, we consider

[1] US 6,298,448 B1, issued Oct. 2, 2001 (Ex. 1005).
[2] US 7,360,103 B2, issued Apr. 15, 2008 (Ex. 1006).
[3] US 2003/0159080 A1, published Aug. 21, 2003 (Ex. 1028).
[4] US 5,838,995, issued Nov. 17, 1998 (Ex. 1003).
[5] US 2004/0098631 A1, published May 20, 2004 (Ex. 1004).

whether "request" implies a negative limitation that excludes a signal, e.g., a command or instruction, acted upon without assessment.

According to Patent Owner, the specification of the '759 patent, supports its claim construction because "the decision-making for frequency control resides in the PCC, *not* the master device."[6] PO Resp. 4; *accord id.* at 9 ("[T]he PCC has an embedded computer program with instructions 156 that decides whether to grant or ignore the request." (citing Ex. 1001, 3:3–6, 5:4–15)). Despite that position, which could be viewed as addressing a capability of the PCC itself rather than the request received by the PCC, Patent Owner asks us to construe "request" as excluding a command. *See* Tr. 50:16–18. Indeed, in distinguishing its claims over Shaffer based on a "request," Patent Owner does not address apparatus claims 14 and 18 separately from method claim 1, although the apparatus claims both recite a "programmable clock controller" that receives a request, whereas method claim 1 does not. *See* PO Resp. 4–14. Thus, we consider whether "request" excludes a signal that is acted on without assessment.

Claim 1 does not include a limitation that requires assessing whether to act on an incoming request. Claim 1 merely recites "receiving a request" from a first master device and, "in response to receiving the request," providing the clock frequency to control a second master device's clock frequency and the bus's clock frequency. Claim 1's language recites only that the claimed outputs are provided "in response to receiving the

[6] "PCC" refers to programmable clock controller, a term in claim 14 and the specification. *See* Ex. 1001, 2:41–50, 5:4–21, 8:59–61.

request"—claim 1 does not require an intervening assessment of any kind be performed.[7]

Patent Owner relies heavily on the specification to argue that the '759 patent's described "PCC need not grant 'requests.'" PO Resp. 11. The specification describes a PCC that receives a request and independently assesses whether to act on the request. Ex. 1001, 5:55–56 ("Moving to decision step 204, the controller determines whether to enable the request to increase the bus speed."). But the specification indicates that this approach is "[i]n a particular embodiment." *Id.* at 5:48–49. It also describes alternative embodiments in which a controller determines whether to set flags indicating high-frequency operation and then increases clock frequency if flags are set. *See id.* at 6:1–7:14.

We do not read the specification's disclosure of alternative embodiments as establishing that the claimed "request" mandates deciding whether to act on the request. Nothing in the specification describes a request that itself requires independent assessment. Stated otherwise, although any given "request" could be evaluated to determine what, if any, action to take in response, any such evaluation does not depend on the nature of the request. The claims do not include language restricting how a request is processed, but instead read on systems or methods in which a certain

[7] As noted, Patent Owner hinges its arguments on construing "request." *See* Tr. 50:16–18. Independent claim 14's programmable clock controller includes instructions to perform a method that, like claim 1's method, receives the request provided by the first master device and provides the claimed outputs without reciting any intervening assessment of the request. Independent claim 18 similarly recites that a clock controller coupled to an arbiter is configured to adjust a variable clock frequency of the bus in response to receiving the request from the first master device, without reciting any intervening assessment of the request.

action is taken in response to a request. At least one example disclosed in the specification is consistent with a system that makes no independent assessment of a request. The example states that "[t]he clock controller can output a variable clock frequency that varies in response to one or more inputs from the at least one master device." *Id.* at 2:38–40. This exemplary embodiment supports Petitioner's contention that we should not construe "request" as requiring independent assessment before acting on the request.

The prosecution history further supports an understanding of the claimed "request" as not requiring assessment before acting. Original application claim 1 recited "receiving an input . . . wherein the input is to request an increase to the clock frequency." Ex. 1010, 18.[8] Original application claim 2, which depended from original application claim 1, recited "determining whether to enable the request to increase the clock frequency of the bus." Ex. 1010, 18 (original claim 2). Thus, the application for the '759 patent included claims that differentiated between requesting an increase in clock frequency with no further assessment of the request (e.g., original application claim 1) and claims that required determining whether to enable the request (e.g., original application claim 2). During prosecution, original application claim 2 and others reciting "determining" steps in connection with a request were cancelled. *See id.* at 18–20; Ex. 1019, 5 (canceling claims 1–29). Accordingly, the prosecution history shows that the applicant intentionally cancelled claims limited to determining whether a request to change the clock frequency should be enabled, i.e., the applicant

[8] Unless noted otherwise, our citations refer to the exhibit's page number, rather than the page numbers of the original documents in the exhibit.

understood the possibility of claiming the distinction now sought, but decided not to limit the claims in that manner.

Finally, Petitioner points out prior art that uses the terms "command," "instruction," and "request" synonymously, suggesting that "request" did not carry the special meaning for which Patent Owner now argues. *See* Pet. Reply 7 (citing Ex. 1055, ¶¶29–32; Ex. 1006, 3:16–17 ("the OS makes a request to set the P-state"), 4:40–44, 5:47–49 ("when the OS specifies a first P-state via SET_PSTATE command"), 9:16–20 ("the OS communicates with the processor to instruct … the new P-state")).

Based on the claim language, the examples in the specification, and the prosecution history, we decline to infer the additional limitation on the term "request" as urged by Patent Owner. Accordingly, we find that the intrinsic evidence supports a construction of "request" that does not require assessing the request before acting in response to the request. We further find that such a construction is consistent with Petitioner's extrinsic evidence of typical usage of the term in the relevant art, i.e. that the challenged claims do not expressly require a determination before acting on the request.

Considering the record as a whole, we conclude that the claims do not require assessing whether to act on a request.

2. "master device"

According to Patent Owner, "[w]hile offering no construction of 'master device,' Petitioner argues that Shaffer's controllers are 'master devices' because they 'could initiate communications like those of the '759 patent.'" PO Resp. 19 (citing Pet. 23); *see* Pet. Reply 11. Patent Owner

submits that "master devices can make clock frequency change requests, while [the '759 patent's] slave devices cannot." PO Resp. 23.

Method claim 1 recites "receiving a request, from a first master device of the plurality of master devices, to change a clock frequency" and, in response to receiving that request, "providing the clock frequency . . . as an output to control a clock frequency of a second master device coupled to the bus." Thus, the claim language requires only that the first master device be able to request clock-frequency changes. The only feature of a master device recited in independent claims 1, 14, and 18 is that a first master device sends a request to change the clock frequency in response to a predefined change in its performance caused by loading during a predetermined interval. *See, e.g.,* Ex. 1001, 8:1–8. The claims do not otherwise limit a master device. None of the claims recites a "slave" device.

The specification describes an embodiment in which two master devices are each coupled to a bus, a clock controller, and an arbiter. Ex. 1001, 2:66–3:5, 3:8–10, Fig. 1. The specification also states that "[t]he first master device 120 may initiate communication with the first slave device 130 by requesting an access token from the arbiter 110 to communicate over the bus 102." *Id.* at 3:12–15. The specification contrasts "slave" devices: "The first slave device 130 may receive data but may not initiate communication with a master." *Id.* at 3:15–17; *accord id.* at 3:17–19 ("That is, the first slave device 130 is disabled to initiate communication."). The patent thus distinguishes "master" from "slave" devices based on the ability to initiate bus communication.

The specification also discloses an embodiment in which "[e]ach of the plurality of devices coupled to the bus 102 provide[s] a corresponding trigger output" where "the trigger output is indicative of a request to change

the clock frequency of the high speed clock 152." *Id.* at 3:64–65, 4:15–17 ("[t]he generation of the trigger output is indicative of a request to change the clock frequency of the high speed clock 152"). That functionality—using trigger outputs to request speed changes—is agnostic as to whether a device is a "master" or "slave" device. Stated otherwise, although the particular embodiment describes master devices that can request frequency changes, the slave devices can also request frequency changes because the specification states that "each" device provides a trigger output. Thus, the specification does not support Patent Owner's assertion that the ability to request clock speed changes distinguishes "master devices" from "slave devices."

We construe master devices as those devices that can initiate communications with other devices but need not be able to send requests to a clock module.

3. *"clock frequency of a second master device"*

Contesting whether Chen discloses providing an "output to control a clock frequency of a second master device coupled to the bus," Patent Owner asserts that "the separate clock frequency of the second master device in the claims refers to the internal clock frequency of the master device, not to an I/O bus frequency." PO Resp. 52. Petitioner replies that receiving a clock frequency for bus transactions satisfies the claim language, regardless of whether a device has a separate internal clock. Pet. Reply 21.

We agree with Petitioner that nothing in the claim language requires that "a clock frequency of a second master device" refer to the "internal clock frequency" of the second master device. *See* Pet. Reply 21 ("[I]t is irrelevant whether [Chen's master] devices could also have other clocks

within them.”). Rather, the phrase “a clock frequency” is generic and does not limit whether the provided clock controls bus communications or another aspect of a second master device. Nor has Patent Owner directed us to the specification’s disclosures that would limit the term beyond a specific embodiment. Patent Owner’s reference to Dr. Conte’s declaration (PO Resp. 52 (citing Ex. 2065 ¶ 186)), cites testimony that simply asserts that skilled artisans “would understand that the I/O bus clock in Chen has nothing to do with the internal clock of the I/O device.” Ex. 2065 ¶ 186. This testimony does not address the proper understanding of “a clock frequency.” On the other hand, Petitioner’s expert, Dr. Jacob, discusses the claims’ broad language. *See* Ex. 1055 ¶¶ 95–96.

We discuss Patent Owner’s implicit claim construction in more detail below. *See infra* at 38 (§ II.D.2).

B. Obviousness over Shaffer and Lint (Claims 1, 14, and 17)

Shaffer discloses a CPU speed control system that provides “the CPU and other system buses in the device with a variable clocking frequency based on the application or interrupt being executed by the device.” Ex. 1005, code (57). Shaffer’s Figure 1 is reproduced below:

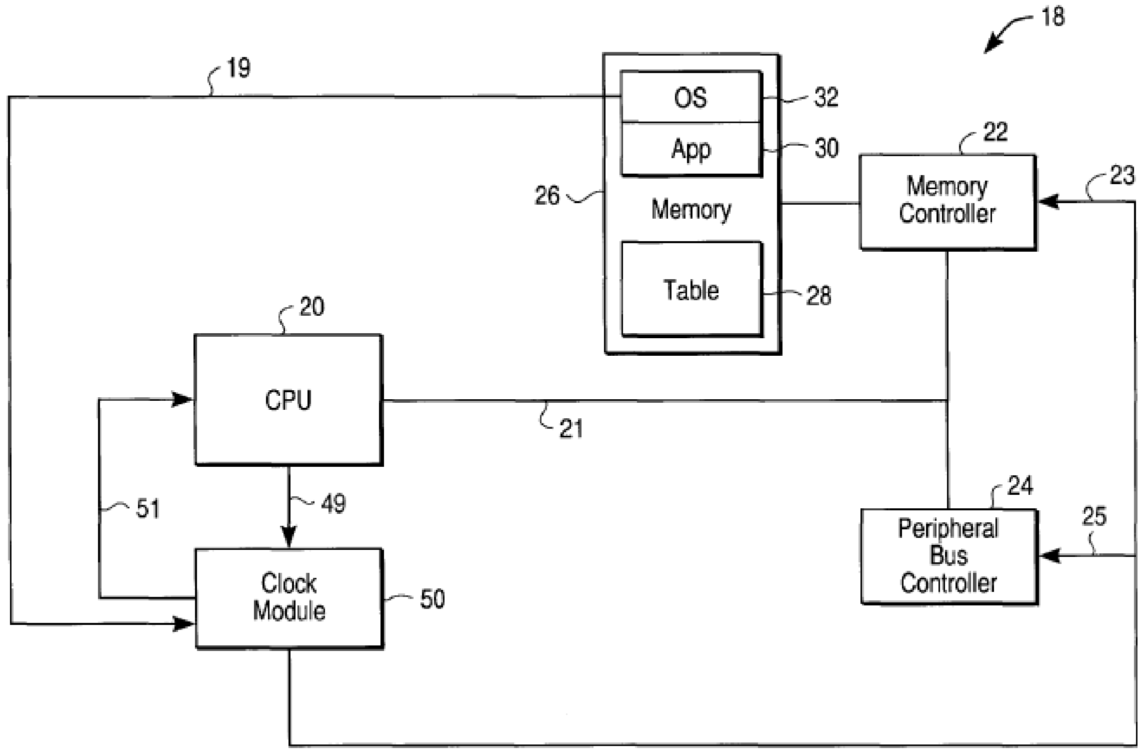

FIG. 1

Figure 1 is a block diagram showing intelligent programmable clock module 50 that provides CPU 20 with a clocking signal and informs CPU 20 of the frequency through line 51. *Id.* at 3:8–23. Additionally, clock module 50 supplies a clocking signal to memory controller 22 through memory clock control line 23 and to peripheral bus controller 24 (also referred to as system bus controller 24) through system bus clock control line 25. *Id.* at 4:26–29. Schaffer discloses that its speed control system "provide[s] a programmable variable clock frequency to the other controllers and buses in the system" such that "data and commands will travel through the data/command bus 21 at a proportionally slower speed" along with CPU 20 operating at the slower speed. *Id.* at 4:15–25.

Shaffer discloses "a multiprocessor system" in which "a single clock module 50 may drive all the processor clocks." *Id.* at 6:2–5. Petitioner

contends that each of the multiple CPUs in a multiprocessor system "are master devices, per the '759 patent." Pet. 23.

Shaffer discloses "a CPU utilization application that dynamically monitors the level of CPU usage." Ex. 1005, 4:53–54; *see id.* 4:50–5:20. That application provides CPU utilization values to the operating system, OS 32, which may then generate "an interrupt to the clock module 50 instructing it to raise or lower the clocking frequency provided to the CPU 20." *Id.* at 5:5–8.

Petitioner relies on Schaffer for most limitations of claim 1, further relying on Lint as teaching the limitation that a "predefined change in performance is due to loading of the first master device as measured within a predefined time interval." Pet. 22–31. Petitioner first asserts that Shaffer teaches this limitation by disclosing that "the CPU 20 operates at a lower speed when the OS 32 determines that no processing is occurring or has not occurred for a predetermined amount of time." *Id.* at 27 (quoting Ex. 1005, 4:6–8). Petitioner relies on Lint as an alternative to Shaffer's teachings in that regard, submitting that Lint discloses "changing the 'performance state . . . based in part on the data representing the average performance over the previous period of time.'" *Id.* (quoting Ex. 1006, 3:1–7). Petitioner reasons (1) that Shaffer describes a "CPU utilization percentage," (2) that Lint discloses a way of calculating the utilization percentage that would allow Shaffer's system "to better interface with processor chips featuring hardware coordination of [performance]-states" by saving power, and (3) that doing so would amount to nothing more than using a known technique to improve similar devices in the same way. *Id.* at 27–30 (citing Ex. 1006, 3:2–7, 2:33).

1. "request"

Petitioner identifies Shaffer's "instructions via lines 19 and 49" as requests from CPU 20 to change a clock frequency of clock module 50. Pet. 23–24 (citing Ex. 1005, 3:8–22 ("CPU 20 in turn can instruct through line 49 the clock module 50 to increase or decrease the output frequency as needed"), 4:50–54 ("OS 32 is used to control the frequency of the clock module 50 in response to a CPU utilization application that dynamically monitors the level of CPU usage.")). Patent Owner argues that Shaffer's instruction is not a "request" because "Shaffer's clock module may not reject these commands; it simply does as it's told." PO Resp. 5–14. As discussed above, however, we do not construe "request" as requiring independent assessment of whether to act on the request. *See supra* at 6 (§ II.A.1). Accordingly, we find that Shaffer teaches a request as claimed.

2. "monitoring a plurality of master devices"

Petitioner asserts that Shaffer discloses "monitoring a plurality of master devices coupled to a bus" because CPU 20, memory controller 22, bus controller 24, and another CPU are coupled to data/command bus 21. Pet. 22 (citing Ex. 1005, Fig. 1, 6:2–5). As to "monitoring," Petitioner cites Shaffer's "CPU utilization application that dynamically monitors the level of CPU usage." Ex. 1005, 4:53–54. As to the memory and bus controllers, Petitioner asserts that skilled artisans "would have understood that Shaffer's 'controllers' could initiate communications, like those of the '759 patent." Pet. 23. Petitioner's expert, Dr. Jacob, testifies that CPU 20, memory controller 22, and peripheral bus controller 24 are master devices, as claimed, because "they are all on the system bus, a shared bus organization." Ex. 1055 ¶ 51; *see also id.* ¶ 46 (asserting that a shared bus supports multiple

masters and requires each to "make its own decisions about when and how to access the shared bus").

Patent Owner argues that Shaffer does not teach or suggest monitoring controllers 22 or 24. PO Resp. 15. According to Patent Owner, because those controllers have no ability to signal a speed change, "there would be no reason to monitor their utilization." *Id.* Additionally, Patent Owner reasons that those devices are much slower than CPU 20, because "the most cost effective method to reduce power consumption is to vary the CPU 20 clock speed." *Id.* (quoting Ex. 1005, 6:12–14). Petitioner replies that skilled artisans would have understood Shaffer's controllers 22 and 24 are monitored. Pet. Reply 9 (citing Ex. 1055 ¶¶ 104–107).

Shaffer discusses "monitoring" in several ways. First, Shaffer describes its clock module as responding to OS-generated signals and gives an example of an idle signal indicating whether the CPU is in an idle state. Ex. 1005, 3:27–59. Shaffer also discloses that the clock module may respond to interrupts indicating user activity like mouse movement or keyboard input. *Id.* at 3:60–4:14. Shaffer further describes that OS signals may be generated by "a CPU utilization application that dynamically monitors the level of CPU usage." *Id.* at 4:51–5:20. Finally, Shaffer describes controlling the clock frequency "in response to the particular application or task being executed by the system." *Id.* at 5:21–47. Dr. Jacob testifies that skilled artisans would have understood Shaffer to disclose monitoring its controllers along with the CPU, explaining that:

> monitoring software typically monitors all of a system's activity, including network traffic, memory traffic, disk traffic, etc. Shaffer's memory controller 22 and peripheral bus controller 24 would be monitored, even if the devices

> consumed little power themselves, because the data traffic through them could very well add up to a significant amount.

Ex. 1055 ¶ 106.

Considering the record as a whole, we are not persuaded that Shaffer discloses monitoring devices beyond CPUs. Although Dr. Jacob asserts that Shaffer's memory controller and peripheral bus controller "would be monitored," Shaffer discloses monitoring through interrupts and a "CPU utilization application," as described above. Petitioner does not explain, through Shaffer's disclosures or Dr. Jacob's testimony, how either a CPU utilization application or interrupt monitoring would include monitoring memory controller 22 or peripheral bus controller 24. Petitioner's assertion that "typical" monitoring software would have included network, memory, and disk traffic, even if true, is insufficient to show that Shaffer's monitoring is consistent with that assertion.

Petitioner, however, relies additionally on Shaffer's disclosure of a multiprocessor system. Pet. 23 ("Shaffer discloses multiple CPUs. These CPUs are master devices, per the '759 patent.") (citations omitted). Petitioner relies also on Shaffer's "CPU utilization application" as monitoring the CPUs. *Id.*

Patent Owner incorrectly asserts that the Petitioner relied "*solely* on Shaffer monitoring *single* CPU 20." PO Sur-Reply 11 (citing Pet. 22–23). The Petition states "[a] POSA would have found it obvious that other CPUs disclosed by Shaffer would have been coupled to the bus." Pet. 23 (citing Ex. 1002 ¶¶ 228–233). The Petition also identifies "another CPU" as one of the plurality of master devices and identifies Shaffer's "CPU utilization application" as monitoring the master devices. Pet. 22–23 (citing, e.g. Ex. 1005, 6:2–5 ("in a multiple processor system (not shown), a separate

clock module 50 may be used for each processor, or a single clock module may drive all the processor clocks").

Patent Owner asserts that "Shaffer does not teach monitoring multiple CPUs in its vague reference to a multi-CPU configuration." PO Sur-Reply 12; *accord* PO Resp. 15–16 ("Shaffer does not provide any details of how such a [multiprocessor] system would operate" and therefore "does not disclose monitoring each CPU in Shaffer's multiprocessor embodiment."). Patent Owner emphasizes Dr. Jacob's statement that "I don't really know what it would do" because Shaffer does not disclose its algorithm "in a multiprocessor scenario." PO Sur-Reply 12 (quoting Ex. 2066, 41:13–42:5). That statement, however, relates to the particular algorithm that Shaffer would apply to make clock-speed changes in a multiprocessor system. Ex. 2066, 41:25–42:1. The challenged claims are not directed to the particular algorithm that would be used in such a multiprocessor system, and therefore, Dr. Jacob's testimony cited by Patent Owner does not diminish Shaffer or Dr, Jacob's opinion that Shaffer's CPU monitoring would include multiple CPUs in a multiprocessor system. Ex. 1055 ¶¶ 105–106; *see also* Pet. Reply 9 (citing Ex. 2066, 89:5–10).

We are persuaded that Shaffer discloses monitoring "CPU utilization" including multiple CPUs in a multiprocessor system. Shaffer's disclosures are not limited to monitoring a single CPU, but rather consider "CPU utilization" generally. Ex. 1005, 4:51–54. Thus, in Shaffer's multiprocessor embodiment, an application that "dynamically monitors the level of CPU usage" would monitor multiple CPUs. This conclusion is further supported by Shaffer's claims, which recite a computer system comprising "one or more CPUs," "a CPU resource utilization monitor to determine the amount of CPU resources being used by the computer system," and "an intelligent

clock module to provide a variable operating frequency to said one or more CPUs." Ex. 1005, 8:10–26.

3. *"control a clock frequency of a second master device"*

Petitioner asserts that Shaffer discloses, in response to a request from CPU 20 executing OS 32, providing a signal from its clock module 50 to control a clock frequency of another CPU coupled to bus 21.[9] Pet. 30; Ex. 1005, 6:2–5 ("[A] single clock module 50 may drive all the processor clocks")).

Patent Owner asserts "Shaffer does not teach or suggest that CPU 20 would change the clock frequency of a second CPU." PO Resp. 17 (citing Ex. 2066, 39:12–19 (Dr. Jacob's testimony about Shaffer's disclosures with two clock modules)). We, however, base our conclusion on Shaffer's discussion of a *single* clock module, and Dr. Jacob's testimony about Shaffer's two-clock-module embodiment is inapposite. Patent Owner submits it would be "contrary to Shaffer's principle of operation and stated goal" to operate both CPUs at the same clock rate despite different utilizations. PO Resp. 17–18. We do not agree, as Shaffer discloses both CPUs operating with a single clock module. Moreover, we credit Dr. Jacob's testimony that symmetric multiprocessor arrangements, in which two processors share in running OS and application tasks, were more common at the time of the invention and more broadly applicable than the single instruction, multiple data (SIMD) arrangement cited by Patent Owner's expert, Dr. Conte, in which two processors perform the same task

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[9] Because we determine above that Shaffer does not disclose monitoring its memory controller 22 or peripheral bus controller 24, we do not address Petitioner's further contentions that rely on those elements and focus instead on Shaffer's multiprocessor embodiment.

simultaneously. Ex. 1055 ¶¶ 56–57. Dr. Jacob testifies that SIMD architecture is "a very narrow type of accelerator architecture in computer design," and is "used in very specific application areas that can exploit such an arrangement (e.g., graphics processing and some high-performance computing)." Ex. 1055 ¶ 57.

Shaffer discloses speed-control systems for personal computers targeting, for example, savings when computers "are left on for extended periods of time, even when not being actively used." Ex. 1005, 1:15–28. Shaffer discloses that its invention is applicable to a broad range of "microprocessor-based devices and/or battery powered intelligent devices that need to conserve battery power, such as PCS, cellular phones, personal digital assistants (PDA), and battery backed-up systems like private branch exchange (PBXs) or medical equipment." *Id.* at 2:55–62. We therefore find Shaffer's disclosures are broadly applicable to multiple architectures, and are not limited to the particular processor arrangement that Dr. Conte proposes. In a multiprocessor system using a single clock module, as Shaffer discloses, the single clock frequency is provided to control the clock frequency of all CPUs (i.e., control a clock frequency of a second master device). *See* Pet. 23 (citing Ex. 1002 ¶ 232 ("As the system uses a shared-bus organization, a person of ordinary skill would understand that any additional CPUs, if present, would be attached to the system bus 21 in the same manner as CPU 20.")).

Shaffer's system operating as Petitioner describes would not be "contrary to Shaffer's principle of operation," as Patent Owner alleges, because Shaffer seeks "to ensure that the CPU is operating at the most power efficient level for *any* given task." Ex. 1005, 2:26–30 (emphasis added). Seeking optimum performance in Shaffer necessarily occurs within the

constraints of a hardware system, and even if a system with two clock modules could achieve higher efficiency in certain situations, that would nonetheless permit an approach using one clock module to control two CPUs performing different tasks. Thus, we find that Shaffer discloses reducing power consumption by reducing system clock speed when the processing workload allows, and discloses doing so in a multiprocessor system with one clock module. Ex. 1005, 4:51–54, 5:5–8, 6:2–5.

4. *"output to control a clock frequency of the bus"*

Petitioner relies on Shaffer's clock module 50 providing a clock signal to Shaffer's system bus. Pet. 31 (citing Ex. 1005, 2:17–19, 4:15–25, 5:66–6:2). Patent Owner contends that Petitioner relies on different buses for different limitations, by pointing to Shaffer's "data/command bus 21" as the bus connecting the asserted master devices, but pointing to Shaffer's "system bus" as receiving the clock signal. PO Resp. 25–28. Patent Owner acknowledges that Petitioner treats the "data/command bus 21" and "system bus" as one and the same, but asserts that Shaffer consistently describes the two separately and assigns a reference numeral to only the data/command bus 21. *Id.* at 26–27.

We find that Shaffer discloses its clock module 50 providing a clock signal to data/command bus 21, the same bus that Petitioner relies on for other limitations. That conclusion arises from Shaffer's disclosures that show its data/command bus 21 is the described system bus. Shaffer's Summary of the Invention refers to "the CPU and other system buses" without mentioning any more-specific bus. Ex. 1005, 2:17–19; accord *id.*, code (57). Shaffer also discloses that the "CPU speed control system 18" provides the clock frequency "to the other controllers and buses in the

system" and specifically mentions the "data/command bus 21." *Id.* at 4:15–25. Figure 1 shows that "data/command bus 21" connects CPU 20 with memory controller 22 and peripheral bus controller 24. *Id.* Fig. 1. Finally, Shaffer discloses that "the clock module 50 drives the entire system bus (as mentioned above) and thereby reduces power requirements for the processor, related chipsets, memory, controllers and the like." *Id.* at 5:66–6:2. Those disclosures demonstrate that Shaffer's clock module 50 provides an output to control a clock frequency of data/command bus 21, because that bus connects the processor, memory, and peripheral controller.

5. *Objective indicia of nonobviousness*

Patent Owner asserts that objective indicia of nonobviousness show that the claimed invention would not have been obvious. PO Resp. 56–61. Patent Owner alleges the existence of commercial success and that the '759 patent proceeded contrary to conventional wisdom. *Id.*

As to commercial success, Patent Owner relies on the jury's verdict awarding damages of $675 million against Intel. *Id.* at 57 (citing Ex. 1027, 6). To establish a nexus between Intel's alleged commercial success and the '759 patent's claims, Patent Owner asserts that the jury was "instructed to determine damages solely based upon the value of the patented inventions apart from any unpatented features." PO Resp. 58 (citing Ex. 2067, 1544:14–16, 1545:13–1546:9); PO Sur-reply 20 (noting that the district court rejected Intel's post-trial motions and entered final judgment).

When the evidence shows that a product includes "the invention disclosed and claimed in the patent," we presume that any commercial success of the product is due to the patented invention. *PPC Broadband v. Corning Optical Commc'ns,* 815 F. 3d 734, 746–747 (Fed. Cir. 2016). Such

a presumed nexus requires not only that a commercial product embodies the claims, but also that it is coextensive with them. *See Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019) ("[P]resuming nexus is appropriate 'when the patentee shows that the asserted objective evidence is tied to a specific product and that product embodies the claimed features, and is coextensive with them." (quoting *Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1072 (Fed. Cir. 2018))).

Petitioner notes that the jury infringement verdict is on appeal and does not apply to all of the challenged claims. Pet. Reply 22–23, n. 8. According to Petitioner, notwithstanding Patent Owner's citation to "cases in support of the proposition that a jury verdict can form part of a commercial success analysis, those cases don't excuse [Patent Owner's] burden on the elements that it must prove." *Id.* at 22–23 (citing *Gambro Lundia AB v. Baxter Healthcare Corp.*, 110 F.3d 1573, 1579 (Fed. Cir. 1997) ("Of course the record must show a sufficient nexus between this commercial success [of the infringing product] and the patented invention.").

Petitioner contends that Patent Owner fails to provide meaningful explanation of its commercial success allegations and fails to show nexus between the claimed features and the alleged commercial success. *Id.* at 22. Petitioner argues that the challenged claims were not the basis for customer demand of the accused products. *Id.* at 23 (citing Ex. 1058, 811:13–812:24 (Intel employee Adam King testifying that Intel's customers care about numerous technical attributes, including graphics performance for video editing, camera quality for video conferencing and power efficiency for laptops)).

Other than the jury verdict, Patent Owner's sole argument that the infringing product's alleged commercial success arose from features claimed

in the ’759 patent cites Intel’s article in an IEEE publication promoting its “Speed Shift” technology. PO Resp. 58 (citing Ex. 2068, 54); PO Sur-reply 20–21. Patent Owner asserts that the IEEE paper describes a “revolutionary” approach in which a device called a PCU, functioning as a programmable clock controller, improves performance over operating-system-based approaches. *Id.* (citing Ex. 2068, 54, Ex. 2065 ¶¶ 72–73).

The IEEE article cited by Patent Owner is not sufficient evidence to demonstrate the requisite nexus. Intel’s employee testified that it takes years and thousands of engineers to build a new generation of processors because such devices include thousands of features and enhancements. Ex. 1058, 811:2–12. Petitioner notes that Patent Owner accused only the Speed Shift feature of infringing the ’759 patent and that Patent Owner’s damages expert, Dr. Sullivan, “conceded that many of the thousands of other features ‘have nothing to do with what [Patent Owner] accuses.’” Pet. Reply 23 (quoting Ex. 1057, 690:19–691:24). Petitioner additionally points out that, in a subsequent trial, Patent Owner’s expert agreed that Intel would have sold the accused products regardless of the alleged infringement. *Id.* (citing Ex. 1061, 771:13–22 (testifying that Intel would have made the same sales, even if the jury found the products not to infringe)).

The record before us does not show that Intel’s product or products underlying the infringement verdict are coextensive with “the invention disclosed and claimed.” *See Fox Factory*, 944 F.3d at 1373, 1377; *see Facebook, Inc. v. Express Mobile Inc.*, IPR2021-01457 Paper 38 at 76–80 (PTAB March 14, 2023) (concluding an infringement verdict was insufficient to establish nexus). Rather, the record shows that the accused products contained many features beyond those relevant to the ’749 patent. Ex. 1057, 690:19–691:24; Ex. 1058, 815:16–816:21.

Other than the jury verdict, Patent Owner has not provided financial information that would allow us to weigh the extent of Intel's commercial success based on the alleged sales of products infringing the claimed invention. In particular, the record does not reflect whether the infringing device represented an increase in market share over a prior, noninfringing device or any other aspect that would allow us to place the verdict's amount in context. *See, e.g.*, *In re Applied Materials, Inc.*, 692 F.3d 1289, 1300 (Fed. Cir. 2012) ("An important component of the commercial success inquiry in the present case is determining whether Applied had a significant market share."). On this record we do not find evidence of commercial success sufficient for purposes of establishing non-obviousness.

As to proceeding contrary to accepted wisdom, Patent Owner submits that, prior to the '759 patent, skilled artisans used the operating system to make speed changes. PO Resp. 59. In Patent Owner's view, the '759 patent instead "uses a request mechanism in which the decision-making for speed changes resides in another component, *e.g.*, the programmable clock controller 150." *Id.* at 60–61. Patent Owner's argument depends on our adopting Patent Owner's construction of "request," which we decline to do. *See supra* at 6 (§ II.A.1); Pet. Reply 24. Accordingly, we do not agree with Patent Owner's assertions that the '759 patent proceeded contrary to accepted wisdom, as the prior art disclosed a "request mechanism" under our construction.

Having considered Patent Owner's assertions regarding objective indicia of non-obviousness, we conclude the evidence of record does not persuasively show success of the infringing products with a nexus to the challenged claims or that the claims proceeded contrary to accepted wisdom.

6. Conclusion

We have considered the full record, including evidence and arguments presented by Petitioner and Patent Owner on whether Shaffer and Lint teach or suggest claim 1's limitations, whether there was a reason that skilled artisans at the time would have combined Shaffer and Lint as asserted, and whether objective indicia indicate the claims would not have been obvious. Based on the full record, we conclude that Petitioner has shown by a preponderance of the evidence that claim 1 would have been obvious over Shaffer and Lint.

7. Claim 14

For claim 14, Petitioner relies mainly on its claim 1 contentions, additionally addressing the language in claim 14 that differs from claim 1. Pet. 31–33. Patent Owner separately addresses claims 14 and 18, which recite systems rather than claim 1's method. PO Resp. 19–25.

As discussed above, we agree with Patent Owner that Shaffer does not disclose monitoring its memory controller 22 and peripheral bus controller 24. *See supra* at 16 (§ II.B.2) (discussing claim 1's "monitoring a plurality of master devices"). Claims 14 and 18 recite a first and second master device and a programmable clock controller that interacts with the master devices, but, unlike claim 1, claims 14 and 18 do not require monitoring multiple master devices. Ex. 1001, 8:50–9:4. Thus, our conclusion regarding claim 1's "monitoring" limitation—that Shaffer does not disclose monitoring its memory and peripheral bus controllers (*see supra* at 16 (§ II.B.2)—does not apply to claims 14 or 18.

Other than the "monitoring" aspect, Patent Owner's arguments against Petitioner's analysis of claims 14 and 18 parallel those made for claim 1.

PO Resp. 14–18 (addressing claim 1's limitations reciting "master devices" and "second master device"), 19–25 (addressing claim 14 and 18's "master devices" and "second master device"). As discussed above, we do not agree that claim construction requires a "second master device" that can request speed changes from the clock controller. *See supra* at 10 (§ II.A.2). Thus, we do not agree with Patent Owner that Shaffer's memory controller and peripheral bus controller cannot be the claimed "second master device" in claims 14 and 18. *See* PO Resp. 20–24 ("Thus, Petitioner fails to prove that a POSITA would have understood Shaffer's controllers 22 and 24 to be master devices within the meaning of the '759."). We conclude that the "second master device" claim language in claims 14 and 18 reads on Shaffer's controllers 22 and 24 as Petitioner asserts. *See* Pet. 30–31, 33. This conclusion is consistent with our construction for "master device," as discussed above. *See supra* at 10 (§ II.A.2).

Patent Owner challenges also whether Shaffer discloses claim 14's requirement that the clock controller controls the clock frequency of a second mater device based on Shaffer's multiple-CPU embodiment. PO Resp. 25 (citing *id.* at 16–18). For the reasons discussed above, we find that Shaffer's multiple-CPU embodiment discloses a single clock controller controlling the clock frequency of a second master device (a second CPU) coupled to the bus. *See supra* at 20 (§ II.B.3). This conclusion is independent of our construction of "master device," as Patent Owner does not argue Shaffer's additional CPU's could not request speed changes.

Considering the full record, including Patent Owner's asserted objective indicia discussed above, we conclude that Petitioner has shown by a preponderance of the evidence that claim 14 would have been obvious over Shaffer and Lint.

8. Claim 17

Petitioner relies on Shaffer as disclosing the additional limitations of claim 17, which depends from claim 14. Pet. 31, 33. Patent Owner does not challenge those contentions. We have reviewed Petitioner's contentions and determine that Petitioner has shown claim 17 would have been obvious over Shaffer and Lint.

C. OBVIOUSNESS OVER SHAFFER, LINT, AND KIRIAKE (CLAIMS 18, 21–22, 24)

For independent claim 18, Petitioner relies on its claim 1 contentions, addressing the differences in the language between claims 1 and 18, and asserting that Kiriake discloses both master devices and the claimed arbiter. Pet. 34–38. For claims 21, 22, and 24, each of which depends from claim 18, Petitioner points to Shaffer's additional disclosures that teach or suggest the additional limitations recited in those claims. Pet. 38–39. Other than as discussed above regarding claim 1, Patent Owner does not dispute Petitioner's contentions. We have reviewed the record, including Patent Owner's asserted objective indicia of nonobviousness, and determine that Petitioner has shown claims 18, 21, 22, and 24 would have been obvious over Shaffer, Lint, and Kiriake.

D. OBVIOUSNESS OVER CHEN AND TERRELL (CLAIMS 1, 14, 17)

Relying on Chen for most limitations of claim 1, Petitioner submits that Terrell teaches requesting a clock speed change "in response to a predefined change in performance of the first master device" and that the predefined change "is due to loading of the first master device as measured within a predefined time interval." Pet. 40–49.

Chen discloses an extension to an input/output ("I/O") bus and bridge chip that allows higher-speed operation. Ex. 1003, code (57), 1:6–8. To that end, Chen discloses a system "for switching between different data transfer speeds." *Id.* at 1:61–62. Chen's host bridge "interconnects a system bus with an I/O bus" and includes control logic to allow "bus transactions at both a high frequency and a lower frequency." *Id.* at 2:1–6.

Chen's Figure 1 is reproduced below:

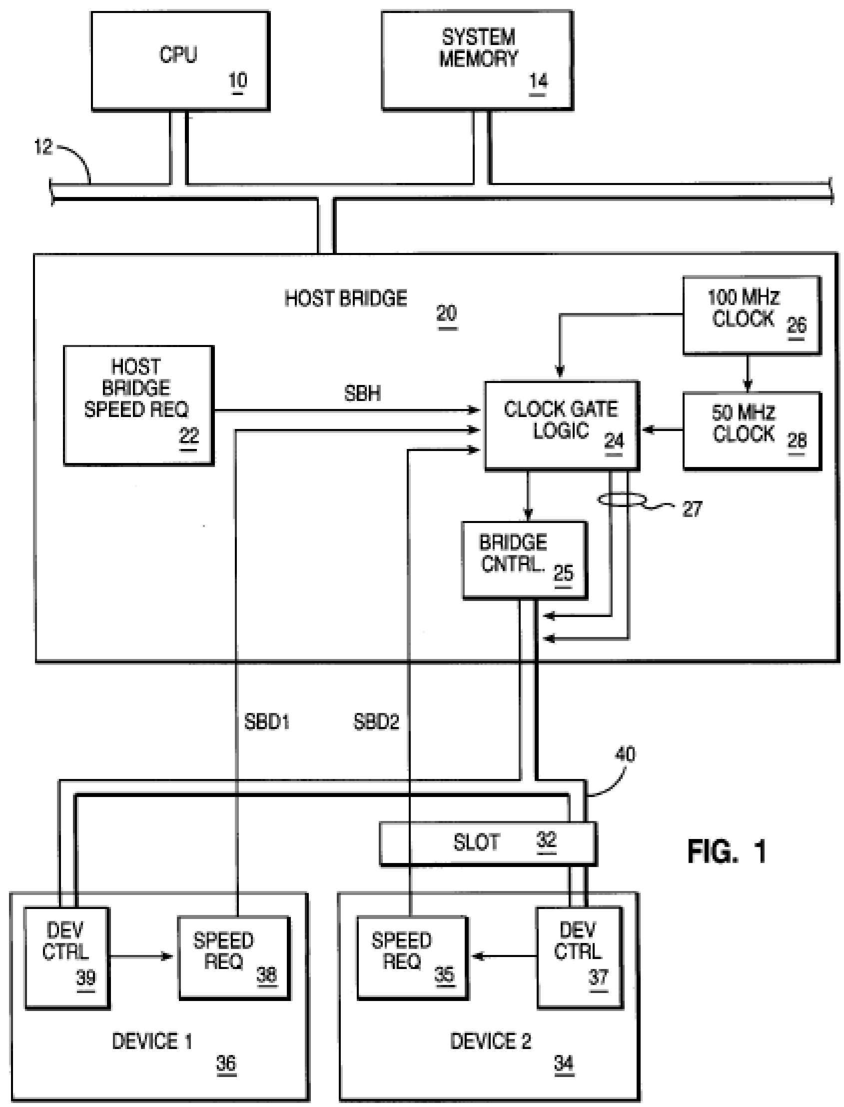

FIG. 1

Figure 1 depicts CPU 10 connected to system bus 12, which connects to host bridge 20, which interconnects system bus 12 with I/O bus 40 that communicates with devices 34 and 36. *Id.* at 2:50–3:4. Device 36 is a "soldered device" while device 34 is a "pluggable device" in slot 32. *Id.* at 3:1–3. Devices 34 and 36 have speed requesting circuits 38 and 35, respectively, that communicate with clock gate logic circuit 24, which causes the frequency of bus 40 to be dynamically changed through unique clock lines 27. *Id.* at 3:4–22.

Terrell discloses a system and method for controlling the frequency of a common clock shared by a number of processing elements. Ex. 1004, code (57). Terrell states that "it is desirable to be able to reduce the frequency of a shared clock to the minimum frequency that allows the processing elements to function correctly while using the least amount of power." *Id.* ¶ 5. Terrell states that its goal would be desirable in "[a]n on-chip bus that hosts two or more bus masters, all of which share a common bus clock." *Id.* ¶ 8.

To implement its approach, Terrell discloses "two basic steps":

> 1. Over a sample period, measure how many clock cycles are being used by each processing element that is attached to the shared clock.
>
> 2. Adjust the system clock frequency to provide the minimum number of clock cycles required by the processing element that is using the largest number of clock cycles.

Id. ¶¶ 25–27.

1. Reason to combine

Petitioner asserts that Chen's master devices 34 and 36 send requests to change a clock frequency, and that skilled artisans would have had reason

to modify Chen's master devices so that they send requests in response to a predefined change in their performance. Pet. 42–47. Petitioner submits that "it was well-known, desirable, and taught by Terrell to save power." *Id.* at 44 (quoting Ex. 1004 ¶ 5 ("[I]t is desirable to be able to reduce the frequency of a shared clock to the minimum frequency that allows the processing elements to function correctly while using the least amount of power.")). Petitioner contends further that Chen teaches embodiments relevant to "a cost-oriented solution and/or low-frequency operations for saving power." *Id.* at 44 (citing Ex. 1003, 5:21–24, 4:36–39, 3:25–29, 3:42–44).

We agree that Chen discloses operating at lower speeds for certain circumstances. For example, Chen discloses using increased frequency for only memory read and write operations, while using lower frequency for bus arbitration and other operations. Ex. 1003, 4:24–36. Chen notes further that the system could use its high-frequency mode for all operations if the "additional cost and complexity is not a factor." *Id.* at 4:36–39. As Patent Owner points out, however, "this increased cost and complexity is fixed at the time of design regardless of whether the bus is run at higher or lower speed." PO Resp. 35–36. Thus, we find that Chen discloses the reduced fixed cost of components that operate only at a lower frequency, but does not disclose reduced power consumption when operating at a lower frequency.

While Chen does not expressly disclose power savings, the record supports a finding that skilled artisans would have understood power savings as an important consideration. *See* Ex. 1056, 386:2–4 (Patent Owner's expert, Dr. Conte, testifying in the litigation that "power savings in designing a processor" is "extremely important"). Indeed, Terrell discloses

that "it is desirable to be able to reduce the frequency of a shared clock to the minimum frequency that allows the processing elements to function correctly while using the least amount of power." Ex. 1005 ¶ 5. We conclude therefore that the prospect of achieving power savings would have motivated skilled artisans to operate Chen's system at a reduced clock frequency when not required by performance demands. *See Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1380 (Fed. Cir. 2023) ("'[U]niversal' motivations known in a particular field to improve technology provide 'a motivation to combine prior art references even absent any hint of suggestion in the references themselves.'" (quoting *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 797–99 (Fed. Cir. 2021))).

Patent Owner contends that Chen and Terrell have opposite goals because Chen focuses on increasing frequency for performance while Terrell focuses on reducing frequency for power savings. PO Resp. 32–37. Petitioner, however, explains how the teachings would work together to "select a clock frequency that increases the devices' frequency only when needed, to reduce power consumption, even if the devices can use higher speeds." Pet. 45. Such a combination is consistent with Chen's teachings of increasing frequency for certain operations, and also consistent with Terrell's teachings of reducing frequency when possible. In this way, we credit Dr. Jacob's testimony that the combination would have balanced "the inherent trade-off between highest performance at the highest cost, and lower (but perhaps still acceptable) performance at a lower cost." Ex. 1055 ¶ 112. Thus, the combined system Petitioner asserts would have been able to operate at reduced frequency (conserving power) in low-activity times and increased frequency when the system required higher performance. *Id.* ¶ 117.

Because the asserted combination would have been able to satisfy a performance demand, we do not agree with Patent Owner that the combination defeats Chen's intended purpose. *See* PO Resp. 37–42. Patent Owner's interpretation, that Chen requires maximum speed at all times, is implausible in light of Terrell's recognition that systems may spend time in an idle state (Ex. 1004 ¶ 54), and Chen's disclosure of operating devices below their maximum speed (Ex. 1003, 3:42–43 ("I/O devices which normally operate at 66 M[H]z can be operated at 50 M[H]z.")). We conclude that Chen's "principle of operation and stated goal" are preserved by the asserted combination, in which bus speed is reduced when performance needs allow and then increased to the limit of a device's capabilities when required.

Patent Owner argues additionally that the asserted combination would have required modifying devices to support reduced speed, and that the required modifications would increase cost and complexity such that skilled artisans would not have made the combination. PO Resp. 42–47. Petitioner responds, on the other hand, that devices with thousands of transistors were commonplace at the time of the '759 patent's invention. Pet. Reply 18 (citing Ex. 1055 ¶¶ 118–119). We agree with Petitioner that the added complexity required by the asserted combination would not have risen to a level that skilled artisans would have been dissuaded from making the combination. In particular, we agree that, by 2005, when the application resulting in the '759 patent was filed, Terrell's approach did not present a significant technological obstacle to a skilled artisan seeking to modify Chen's system. *See* Pet. Reply 18. We credit Dr. Jacob's testimony that technology had advanced considerably following Chen's mid-1990s disclosure such that the modification would have imposed a modest

challenge. *See* Ex. 1055 ¶ 118–119. That same technological progress likewise would minimize any challenge skilled artisans would have had with modifying Chen's master devices. *See* PO Resp. 42–43. Those devices would have required only modest changes to work with the modified system, and skilled artisans implementing Chen's system in 2005 would have done so with integrated devices, thus eliminating Patent Owner's asserted need to modify a host of disparate devices. *See* Ex. 1055 ¶¶ 119, 132–137.

Patent Owner further challenges Petitioner's reliance on Terrell's statement that its teachings apply to "[a]n on-chip bus that hosts two or more bus masters, all of which share a common bus clock." Ex. 1004 ¶¶ 6, 8; PO Resp. 47–48 (citing Pet. 46). Patent Owner points out that Chen's bus 40 is a peripheral, off-chip bus and implicates different design constraints. *Id.* Petitioner contends that, regardless of whether Chen's bus is itself an on-chip bus, technological progression after Chen resulted in master devices moving on-chip and using an on-chip bus. Pet. Reply 19 (citing Ex. 1055 ¶¶ 132–137). Notwithstanding Dr. Jacob's testimony that Chen's system would be implemented differently by the time of the '759 patent, the dispute does not change our determination because, as discussed above, Petitioner has shown that skilled artisans would have made the asserted combination, aside from Terrell's statement about on-chip buses. Terrell's statement of particular applicability to on-chip buses does not undermine its separate statement regarding the desirability of reducing power consumption by reducing clock frequency when possible. Ex. 1004 ¶ 5. That express teaching shows that skilled artisans understood the possibility of reducing power by reducing frequency.

We conclude that skilled artisans had reason to arrive at the asserted combination.

2. *"providing the clock frequency . . . as an output to control a clock frequency of a second master device"*

Petitioner contends that, in Chen, when the first master device requests a clock-frequency change, Chen's clock gate logic 24 provides the high-speed clock on clock line 27 as an output to control a clock frequency of a second master device coupled to the bus. Pet. 48. Because the master devices may conduct "peer to peer transactions," when both indicate they support high-speed communications, they both receive the same clock frequency. Ex. 1003, 5:13–24 ("With the PCI, and some other I/O bus specifications, each device is required to receive its own unique clock signal."), 5:25–29 ("[E]ach device receives its own unique clock line which will be clocked at the appropriate frequency."), 5:59–65 (discussing peer-to-peer transfer).

Further, Petitioner contends Chen provides that same frequency to the bus to facilitate the communication. Pet. 49 (citing Ex. 1003, 2:8–14 ("In response to" a signal indicating high-frequency capability, "control logic in the bridge chip causes the higher frequency clock in the bridge chip to be activated such that the host bridge, bus and I/O device are all then operating at the higher frequency.")).

Patent Owner responds that Chen does not disclose providing the clock frequency as an output to control a clock frequency of a second master device because Chen discloses controlling only the bus frequency, not the master device frequency itself. PO Resp. 48–56. Patent Owner points to Chen's disclosure that "[c]lock gate circuit 24 causes the frequency of bus 40 to be dynamically changed (gated) by transmitting the appropriate device unique clock lines 27." *Id.* at 49–50 (quoting Ex. 1003, 3:20–22). In Patent Owner's view, Chen's clock lines 27 can serve to control the bus

frequency *or* the master devices' frequencies, but not both. *Id.* at 49. Patent Owner reasons that Chen's I/O devices "included an internal clock, separate and apart from the PCI bus clock," and thus cannot satisfy the claim language. *Id.* at 50. For support, Patent Owner cites "the OTI Sound/Fax Card," which Patent Owner views as an exemplary device from Chen. *Id.* at 50–52; PO Sur-Reply 18 (citing Ex. 1003, 1:18–22).

Chen states in its discussion of the background that "many I/O devices, such as . . . sound cards, and the like still operate at frequencies ranging from 33 M[H]z to 66 M[H]z." Ex. 1003, 1:18–22. Although Patent Owner argues the OTI Sound/Fax Card is an exemplary sound card contemporaneous with Chen, Patent Owner does not establish that all I/O devices compatible with Chen would have had internal clocks such that Chen did not provide a clock output to its I/O devices. We agree with Dr. Jacob, who testifies that Chen indicates the opposite—that its bus devices did not necessarily have separate, internal clocks. Ex. 1055 ¶ 124–126. Dr. Jacob explains that because Chen discloses distinct bus clock lines for each bus device, Chen suggests that the bus clock *does* run the devices' internal circuitry. *Id.* On Chen's shared bus, devices not involved in an active communication would have no need for their bus interfaces to remain active, so there would be no point to sending them a clock signal different from the active bus clock. If, instead, those devices were relying on the bus clock for more than bus communication—i.e., to run their internal circuity—then sending the distinct clock signal at a frequency different from active bus communication would allow those devices to remain operational while bus communication occurs with other devices. *Id.* Because multiple distinct clock lines come at a cost, Chen's designers would only include those clock lines if they provided a benefit. *Id.* Based on the record, we agree with

Petitioner and find that at least some of Chen's bus devices use the bus clock to control their internal operations.

Moreover, we do not agree with Patent Owner's implicit claim construction that "providing the clock frequency . . . to control a clock frequency of a second master device" refers only to "the internal clock frequency of the master device, not to an I/O bus frequency" PO Resp. 52 (citing Ex. 2065 ¶ 186). To assert that Chen does not teach providing the clock to control a clock frequency of a second master device, Patent Owner relies on the testimony of Dr. Conte. Dr. Conte explains that in the exemplary OTI Sound/Fax Card, "the LCLK is an input clock – the PCI clock – that would allow the OTI Sound/Fax Card to communicate over the PCI bus" and "is separate from and has nothing to do with an internal clock source (MCLKSR) of the OTI Sound/Fax Card." Ex. 2065 ¶ 186. Dr. Conte concludes that skilled artisans "would understand that the I/O bus clock in Chen has nothing to do with the internal clock of the I/O device (such as the OTI Sound/Fax Card's MCLKSR clock)." *Id.* Dr. Conte does not explain why "a clock frequency of a second master device" is restricted as a matter of claim construction to an internal clock frequency separate from the commanded bus frequency. Without a sound basis in the intrinsic record—which Patent Owner has not explained—we decline to limit "a clock frequency of a second master device" as a matter of claim construction to "an internal clock separate and apart from the bus clock" as Patent Owner seeks. PO Resp. 50–52 (distinguishing I/O devices with "an internal clock . . . separate and apart from the PCI clock"); Pet. Reply 21; Ex. 1055 ¶ 94–96 (explaining that controlling "a clock frequency" includes "controlling the device's data-interface frequency"); *see supra* at 12 (§ II.A.3). Accordingly, we agree with Petitioner that "Chen's master devices and bus would be

clocked to the same frequency when conducting transactions over the bus" and that, therefore, "it is irrelevant whether such devices could also have other clocks within them." Pet. Reply 21.

Relatedly, Patent Owner argues that Chen's "clock line 27 output by clock gate logic 24" can satisfy only one of the limitations that require both (1) an output to the second master device and (2) an output to the bus. PO Resp. 53–55. We do not agree, in light of Chen's disclosure that "control logic in the bridge chip causes the higher frequency clock in the bridge chip to be activated such that the host bridge, bus and I/O device are all then operating at the higher frequency." Ex. 1003, 2:8–14; *accord id.* at 4:63–5:5 ("Clock gate logic 24 will then enable the high frequency clock 26 and drive bus 40 at 100M[H]z."). Chen's disclosures support that clock gate logic 24 provides the clock frequency to both the bus itself (via the bridge chip) and the bus devices (via the distinct device clock lines).

In view of the foregoing, we find that Chen discloses providing the clock frequency of the high-speed clock as an output to control a clock frequency of a second master device coupled to the bus and as an output to control a clock frequency of the bus.

3. Conclusion

We have considered the full record, including evidence and arguments presented by Petitioner and Patent Owner on whether Chen and Terrell teach or suggest claim 1's limitations, whether there was a reason that skilled artisans at the time would have combined Chen and Terrell as asserted, and whether objective indicia indicate the claims would not have been obvious. Based on the full record, we conclude that Petitioner has shown by a preponderance of the evidence that claim 1 would have been obvious over

Chen and Terrell. Patent Owner's arguments discussed above apply to claims 1 and 14. *See* PO Resp. 48–49. We conclude that Petitioner has shown by a preponderance of the evidence that claim 14 would have been obvious over Chen and Terrell. Pet. 49–52.

Petitioner relies on Chen and Terrell as disclosing the additional limitations of claim 17, which depends from claim 14. Pet. 52–53. Patent Owner does not challenge those contentions. We have reviewed Petitioner's contentions and determine that Petitioner has shown claim 17 would have been obvious over Chen and Terrell.

E. Obviousness over Chen, Terrell, and Kiriake (Claims 18, 21, 22, 24)

For independent claim 18, Petitioner relies on its claim 1 contentions, additionally addressing the unique claim language and asserting that Kiriake discloses both master devices and the claimed arbiter. Pet. 54–59. For claims 21, 22, and 24, each of which depends from claim 18, Petitioner points to Chen's additional disclosures that render obvious the additional limitations. Pet. 59–60. Patent Owner does not challenge those contentions. We have reviewed Petitioner's contentions and determine that Petitioner has shown claims 18, 21, 22, and 24 would have been obvious over Chen, Terrell, and Kiriake.

F. Patent Owner's Motion to Exclude

Patent Owner moves to exclude Dr. Jacob's Declarations (Ex. 1002 and Ex. 1046, "Original Declarations") as inadmissible hearsay under Federal Rules of Evidence 801 and 802. Paper 88 ("PO Mtn. Exclude"). Patent Owner argues that the Original Declarations were not "executed in connection with the current proceeding, and therefore were not made 'while

testifying at the current trial or hearing.'" PO Mtn. Exclude, 2–3; Fed. R. Evid. 801(c)(1).[10] Patent Owner asserts that the Board was incorrect in the Institution Decision when we concluded that cross-examination would address hearsay concerns. *Id.* at 4. Finally, Patent Owner contends that no hearsay exceptions apply, citing Fed. R. Evid. 804(b)(1), 803(18).

Petitioner argues that Dr. Jacob's Original Declarations are not inadmissible hearsay. Paper 94 ("Pet. Opp. Mtn. Exclude"), 11. Petitioner points to 37 C.F.R. § 42.53(a), which states "[u]ncompelled direct testimony must be submitted in the form of an affidavit." *Id.* Despite that the Original Declarations were prepared for another proceeding, Petitioner argues that they are not hearsay because (1) they were submitted as sworn witness statements in lieu of live testimony in this proceeding, (2) Dr. Jacob reaffirmed them in the joinder proceeding (IPR2022-00366, Ex. 1049), and (3) Dr. Jacob was subject to cross-examination on the contents of the Original Declarations in this proceeding. *Id.* at 12–13. Indeed, during cross-examination, Dr. Jacob confirmed that the Original Declarations set forth his opinions regarding the '759 patent. Ex. 2066, 69:12–17 (identifying Ex. 1002), 72:11–21 (identifying Ex. 1046), 73:4–10 (confirming the declarations set forth his opinions).

We agree with Petitioner and deny Patent Owner's motion because Dr. Jacob's cross-examination and his confirmation of the declarations in this proceeding address Patent Owner's hearsay concern.[11] IPR testimony is

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[10] Petitioner does not dispute that Dr. Jacob's Original Declarations are offered "to prove the truth of the matter asserted." PO Mtn. Exclude 3; Fed. R. Evid. 801(c)(2).

[11] Patent Owner's argument that OpenSky did not contact Dr. Jacob before filing its Petition with Dr. Jacob's Declarations is not persuasive in light of his willingness to testify in this proceeding. PO Mtn. Exclude 6–10.

different from that in district courts. Notably, the Board's rules generally do not allow an expert to "testify" in person at an IPR hearing. *See* 37 C.F.R. § 42.53 (a)–(b)(1); 35 U.S.C. § 316(a)(5); 35 U.S.C. § 23. Testimony is instead submitted as evidence in the form of affidavits and deposition transcripts. *See* 37 C.F.R. §§ 42.53, 42.63. Our rules, therefore, contemplate that declarants in IPRs do not "testify" in the traditional sense of giving live testimony in a courtroom.

As other Board decisions have noted, "[w]ithout exception, the Board accepts the filing of sworn witness declarations in lieu of live testimony in administrative patent trials." *Grünenthal Gmbh v. Antecip Bioventures II LLC*, PGR2018-00062, Paper 32 at 15 (PTAB Oct. 29, 2019). Our procedures adopt that practice for its efficiency and ensure fairness by allowing cross-examination. *See id.*; 37 C.F.R. § 42.51(b)(ii). Dr. Jacob has made himself available for cross-examination and confirmed that the declarations express his opinions here, in this proceeding. Thus, in these respects, the Original Declarations are no different than the other testimony relied on by the parties, and are not hearsay subject to exclusion.

Indeed, during his cross-examination, Dr. Jacob confirmed that the Original Declarations set forth his opinions regarding the '759 patent. Ex. 2066, 69:12–17 (identifying Ex. 1002), 72:11–21 (identifying Ex. 1046), 73:4–10 (confirming the declarations set forth his opinions). In Intel's proceeding asserting the same grounds and seeking joinder, Dr. Jacob filed a declaration reaffirming his Original Declarations and confirming that he would appear for cross-examination. IPR2022-00366, Ex. 1049. We noted that Dr. Jacob's reaffirming declaration and availability for cross-examination allayed concerns about hearsay. Paper 43 (joinder decision), 15. While the reaffirming declaration is not of record in this proceeding,

Dr. Jacob's deposition in this proceeding and statements confirming his opinions serve the same role. Patent Owner has suffered no prejudice from Dr. Jacob's Original Declarations.

We have considered Patent Owner's other arguments (Paper 95) and find them just as unavailing. The fact that the Jacob declarations were prepared for another proceeding is immaterial in this case because Dr, Jacob has expressly adopted them for *this* proceeding. *Id.* at 1–3. Nor is a hearsay exception necessary, as the reaffirmance of the prior testimony by Dr. Jacob and his cross-examination *in this proceeding* overcomes any plausible hearsay argument or the necessity for a hearsay exception. *Id.* at 3–5. Finally, there is no merit to Patent Owner's suggestion (*id.* at 5) that reliance on Dr. Jacob's reply declaration is somehow contrary to our procedures, which specifically provide for replies by the petitioner (including new declarations). *See* USPTO Consolidated Trial Practice Guide 73 (Nov. 2019).[12]

For the reasons given, we deny Patent Owner's Motion to Exclude.

III. CONCLUSION[13]

For the reasons discussed and based on the entire record, Petitioner has shown by a preponderance of the evidence that claims 1, 14, 17, 18, 21,

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[12] Available at https://www.uspto.gov/TrialPracticeGuideConsolidated.

[13] Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of

22, and 24 are unpatentable. Patent Owner has not shown that we should exclude Exhibits 1002 and 1046.

In summary:

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claim(s) Shown Unpatentable	Claim(s) Not shown Unpatentable
1, 14, 17	103	Shaffer, Lint	1, 14, 17	
18, 21, 22, 24	103	Shaffer, Lint, Kiriake	18, 21, 22, 24	
1, 14, 17	103	Chen, Terrell	1, 14, 17	
18, 21, 22, 24	103	Chen, Terrell, Kiriake	18, 21, 22, 24	
Overall Outcome			1, 14, 17, 18, 21, 22, 24	

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has shown by a preponderance of the evidence that claims 1, 14, 17, 18, 21, 22, and 24 are unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Exclude (Paper 88) is denied; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

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EXHIBIT 7

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Paper No. 31
Entered: February 5, 2019

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CANON INC., CANON U.S.A., INC.,
and AXIS COMMUNICATIONS AB,.
Petitioner,

v.

AVIGILON FORTRESS CORPORATION,
Patent Owner.

Case IPR2017-01833
Patent 6,970,083 B2

Before KRISTEN L. DROESCH, GEORGIANNA W. BRADEN, and KIMBERLY McGRAW, *Administrative Patent Judges*.

McGRAW, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

In this *inter partes* review, instituted pursuant to 35 U.S.C. § 314, Canon Inc., Canon USA, Inc., and Axis Communications AB, (collectively "Petitioner") challenges the patentability of claims 1–29 of U.S. Patent No. 6,970,083 B2 (Ex. 1001, "the '083 patent"), assigned to Avigilon Fortress Corp. ("Patent Owner").

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision, issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73, address issues and arguments raised during trial. For the reasons discussed below, we determine Petitioner has shown by a preponderance of the evidence that claims 1–29 of the '083 patent are unpatentable. Additionally, we deny-in-part and dismiss-in-part Patent Owner's Motion to Exclude, and we deny Patent Owner's Contingent Motion to Amend.

A. Procedural History

Petitioner filed a Petition (Paper 1, "Pet.") requesting an *inter partes* review of claims 1–29 ("the challenged claims") of U.S. Patent No. 6,970,083 B2 (Ex. 1001, "the '083 patent"). *See* Pet. 1. The Petition was supported by a Declaration of Nikolaos Papanikolopoulos, Ph.D. (Ex. 1002). Patent Owner filed a Preliminary Response. Paper 7 ("Prelim. Resp."). On February 5, 2018, we instituted *inter partes* review of the challenged claims. Paper 8 ("Dec. on Inst.").

Thereafter, Patent Owner filed a Patent Owner Response (Paper 12, "PO Resp.") supported by a Declaration of Alan Bovik, Ph.D. (Ex. 2014). In addition, Patent Owner's Response cites to a 37 C.F.R. § 1.132 Declaration of Kenneth R. Castleman (Ex. 1013) that was submitted originally in connection with the reexamination proceeding of the '083 patent. Petitioner

filed a Reply to the Patent Owner Response (Paper 17, "Reply"), supported by declaration testimony of Dr. Papanikolopoulos (Ex. 1036). Patent Owner filed a Contingent Motion to Amend (Paper 13, "Mot. to Amend") supported by declaration testimony of Dr. Bovik (Ex. 2015). Petitioner filed an Opposition to Patent Owner's Contingent Motion to Amend (Paper 16, "Opp. to Mot. to Amend"), supported by a second declaration of Dr. Papanikolopoulos (Ex. 1036) to which Patent Owner filed a Reply (Paper 19, "Reply to Opp. to Mot. to Amend"). Patent Owner also filed a Motion to Exclude Evidence (Paper 24), to which Petitioner filed an Opposition (Paper 26) and Patent Owner filed a Reply (Paper 28).

Oral hearing was requested by both parties. Papers 23, 25. A consolidated oral hearing for this proceeding and Cases IPR2017-01835 and IPR2017-01837 was held on October 19, 2018. A transcript of the consolidated hearing has been entered into the record. Paper 30 ("Tr.").

B. Related Proceedings

The parties identify Case IPR2017-01835 and Case IPR2017-01837 concerning U.S. Patent No. 6,696,945 B2 ("the '945 patent),[1] as related matters. *See* Pet. 82; Paper 6, 1 (Patent Owner's Mandatory Notices).

C. The '083 Patent

The '083 patent, titled "Video Tripwire," issued November 29, 2005, from U.S. Patent Application No. 10/704,645, filed on November 12, 2003. Ex. 1001, at [54], [45], [21], [22]. The '083 patent is drawn to systems and methods in which a video tripwire, also called a virtual tripwire, is placed in

[1] The '083 patent is a continuation-in-part of U.S. Application No. 09/972,039, which issued as the '945 patent.

digital video using computer-based video processing techniques. *Id.* at 2:60–63. The video tripwire is monitored in order to detect intrusions, record events, compile statistics, and trigger responses. *Id.* at 2:63–66. An embodiment of the method is illustrated in Figure 5 of the ’083 patent, reproduced below.

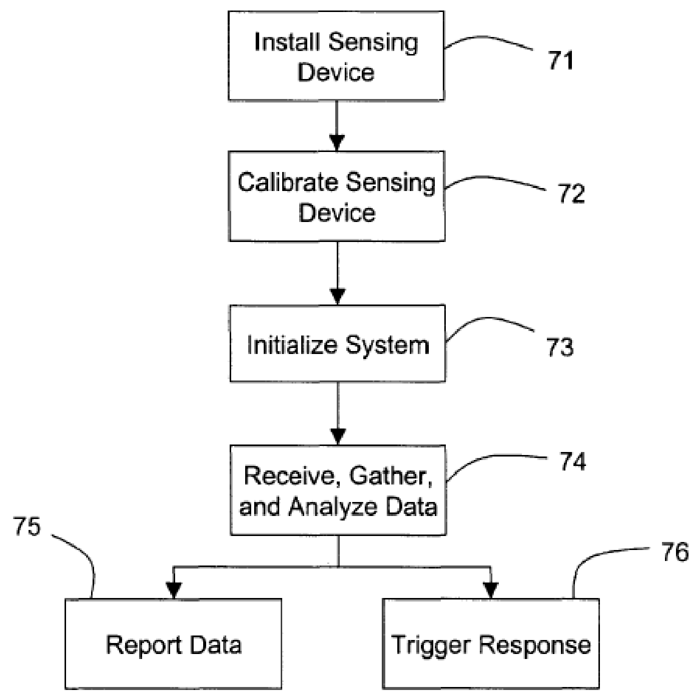

Figure 5

The flow chart of Figure 5, shown above, illustrates a method of the ’083 patent in which a sensing device, such as a video camera, is installed (step 71). *Id.* at 6:11–13. The sensing device is then calibrated so as to determine the size of objects at various locations in the image area (step 72). *Id.* at 6:21–33; *see also id.* at 6:33–9:2 (further describing calibration steps). Next, the system is initialized (step 73), during which the user can enter parameters relating to how the system will gather, respond to, and report

data. *Id.* at 9:3–6. The ’083 patent explains that a “user may superimpose one or more lines of interest on the image; these lines will serve as one or more tripwires.” *Id.* at 9:7–9. “The lines may be of any orientation and may be placed almost anywhere in the image; the exception is that the line may not occur too close to image boundaries because the object (e.g., person) crossing the line must be at least partially visible on both sides of the line for detection to occur.” *Id.* at 9:7–13. “Other parameters that may be initialized include . . . a direction of crossing each line as a criterion for event detection (for example, to determine when a person enters an area, as opposed to when it is desired to determine when a person either enters or exits the area).” *Id.* at 9:19–24. After initialization (step 73), the system “collects and analyzes data” (step 74). *Id.* at 10:16–17. For example, if a tripwire event specified by the user is detected, the event is logged along with accompanying information. *Id.* at 10:19–21. The tripwire event can trigger an alarm or other response (step 76). *Id* at 10:23–25.

Figure 11, reproduced below, shows a flowchart depicting an exemplary embodiment of a step of detecting a tripwire crossing. *Id.* at 4:42–43.

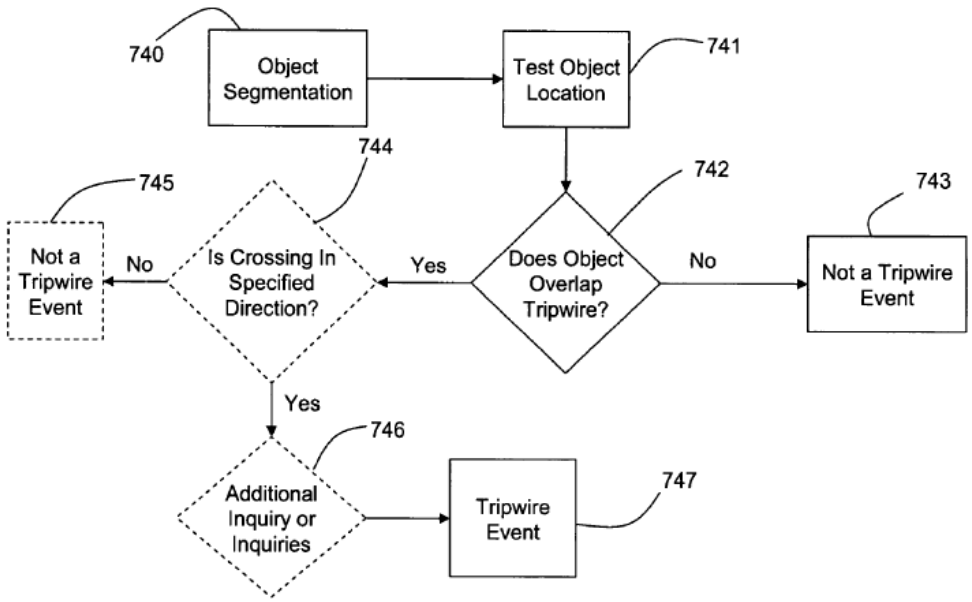

Figure 11

Figure 11, shown above, illustrates a technique for analyzing and detecting tripwire events. *Id.* at 10:26–28. Foreground ("FG") objects are first determined from the video using object segmentation 740. *Id.* at 10:28–29. The location of a FG object is then tested 741 to determine if it "overlaps" a line representing a tripwire 742. *Id.* at 10:31–33. An object is determined to cross a tripwire if the bottom portion of the object overlaps a tripwire line. *Id.* at 10:35–36. If it is determined that no overlap occurs, there is no tripwire event 743. *Id.* at 10:36–38.

1. Illustrative Claims

Of the challenged claims, claims 1, 7, 12, 25, 26, and 28 are independent. Claims 1, 7, and 26 are illustrative of the claims at issue and are reproduced below, with bracketed material and formatting added for clarity.

1. [a] A video tripwire system comprising:

   [b] a sensing device producing video output; and

[c] a computer system, including a user interface, for performing calibration and

[d] for gathering and processing data based on video output received from the sensing device,

[e] the user interface comprising input means and output means, said input means including a graphical user interface, wherein the computer system displays processed data, and

[f] wherein said graphical user interface is adapted to enable a user to draw a video tripwire on at least one of a video image of said video output or a snapshot taken from said video output.

7. [a] A video tripwire user interface comprising:

[b] a graphical user interface adapted to enable a user to draw a video tripwire on at least one of a video image and a snapshot from a video stream.

26. A method of implementing a video tripwire system comprising:

[b] calibrating a sensing device to determine sensing device parameters for use by the system;

[c] initializing the system, including entering at least one virtual tripwire, said at least one virtual tripwire comprising at least one of a curved tripwire, a multi-segment tripwire, and a multiple parallel tripwire;

[d] obtaining data from the sensing device;

[e] analyzing the data obtained from the sensing device to determine if the at least one virtual tripwire has been crossed; and

[f] triggering a response to a virtual tripwire crossing.

D. Instituted Grounds

We instituted an *inter partes* review of the challenged claims on all of Petitioner's requested grounds as set forth in the table below.

Reference(s)	**Basis**	**Challenged Claims**
Autoscope[2]	§ 102(b)[3]	1–29
Autoscope and Togashi[4]	§ 103(a)	1–6, 25, and 28–29
Winter[5]	§ 102(b)	1–25, 28, and 29
Winter and Olson[6]	§ 103(a)	1–6 and 25–29
Winter, Olson, and Togashi	§ 103(a)	1–6, 25, and 28–29

II. DISCUSSION

A. Principles of Law

To prevail in challenging Patent Owner's claims, Petitioner has the burden of demonstrating by a preponderance of the evidence that the claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). That burden never shifts to the Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed.Cir.2015).

A claim is anticipated under 35 U.S.C. § 102 only if "each and every element as set forth in the claim is found, either expressly or inherently

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[2] *The Autoscope 2004 Supervisor User Guide* (1999) (Ex. 1003, "Autoscope").
[3] The Leahy–Smith America Invents Act, Pub. L. No. 112–29, 125 Stat. 284 (2011) ("AIA"), amended 35 U.S.C. §§ 102 and 103. Because the '083 patent has an effective filing date before the effective date of the applicable AIA amendments, we refer to the pre-AIA version of §§ 102 and 103.
[4] Japanese Patent Application Publication No. H3-242592 (pub. Oct. 29, 1991) (Ex. 1006, "Togashi"). Citations to this reference are to its English translation (Ex. 1007).
[5] U.S. Patent No. 5,875,305, iss. Feb. 23, 1999 (Ex. 1004, "Winter").
[6] Thomas J. Olson et al., *Moving Object Detection and Event Recognition Algorithms for Smart Cameras*, Proceedings of 1997 Image Understanding Workshop, 159–175 (May 11–14, 1997) (Ex. 1005, "Olson").

described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co.*, 814 F.2d 628, 631 (Fed. Cir. 1987). A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time of the invention to a person having ordinary skill in the art. *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness, i.e., secondary considerations.[7] *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). The level of ordinary skill in the art may be reflected by the prior art of record. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

Additionally, a determination of obviousness cannot be made with conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness. *KSR*, 550 U.S. at 418; *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006). We must be careful not to allow hindsight reconstruction of references to reach the claimed invention without any explanation as to how or why the reference would produce the claimed invention. *Kinetic Concepts, Inc. v. Smith & Nephew, Inc.*, 688 F.3d 1342, 1368 (Fed. Cir. 2012) (quoting *Innogenetics, N.V. v. Abbott Labs.*, 512 F.3d 1363, 1374 n.3 (Fed. Cir. 2008)); *see also KSR*, 550 U.S. at 421 ("A factfinder should be

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[7] The record does not contain evidence or argument of objective evidence of non-obviousness.

aware, of course, of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning.”).

We analyze the asserted grounds of unpatentability in accordance with the above-stated principles.

B. Level of Ordinary Skill in the Art

In determining whether an invention would have been obvious at the time it was made, we consider the level of ordinary skill in the pertinent art at the time of the invention. *Graham*, 383 U.S. at 17. Petitioner contends a person of ordinary skill in the art at the time of the alleged invention of the ’083 patent (a “POSITA”) would have had one of the following: (i) a bachelor’s degree in electrical engineering, computer engineering, or computer science with at least three years of experience working in image processing, (ii) a master’s degree in electrical engineering, computer engineering, or computer science with at least two years of experience working in image processing, or (iii) a Ph.D. in electrical engineering, computer engineering, or computer science, focusing on image processing or other equivalent experience. Pet. 23 (citing Ex. 1002 ¶ 57). Petitioner’s declarant further states, *inter alia*, that these descriptions are approximate and additional educational experience could make up for less work experience and vice versa. Ex. 1002 ¶ 57.

Patent Owner does not dispute Petitioner’s proposed definition. *See generally* PO Resp. Patent Owner’s Declarant, Dr. Bovik, however, provides his own assessment and states that a POSITA for the ’083 patent would have a bachelor’s degree in computer science, computer engineering, electrical engineering, or an equivalent degree, and at least two years of experience in the design and programming of video systems. Ex. 2014 ¶ 20. Dr. Bovik

further states that a POSITA would be familiar with the fundamentals of graphical user interfaces, image (e.g., video) capture devices, image (e.g., video) processing, and network protocols. *Id.*

Based on our review of the ’083 patent, the types of problems and solutions described in the ’083 patent and cited prior art, and the testimony of Dr. Bovik and Dr. Papanikolopoulos, we adopt and apply Dr. Bovik’s definition of a person of ordinary skill in the art at the time of the claimed invention for purposes of this Decision. We note, however, that our analysis would be the same under either parties’ definition of a POSITA.

C. Claim Construction

In an *inter partes* review, we construe claim terms in an unexpired patent according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b)(2017); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard).[8] Consistent with the broadest reasonable construction, claim terms are presumed to have their ordinary and customary meaning as understood by a person of ordinary skill in the art in the context of the entire

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[8] The Office recently promulgated changes to the claim-construction standard applied in *inter partes* review proceedings. *Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings before the Patent Trial and Appeal Board*, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (to be codified at 37 C.F.R. pt. 42). Because the Petition was filed before November 13, 2018, the effective date of the rule change, those changes do not apply to this proceeding. *Id*. at 51,345 (“The Office will continue to apply the BRI standard for construing unexpired patent claims ... in AIA proceedings where a petition was filed before the effective date of the rule.”).

patent disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). "Although an inventor is indeed free to define the specific terms used to describe his or her invention, this must be done with reasonable clarity, deliberateness, and precision." *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). To act as its own lexicographer, a patentee must "clearly set forth a definition of the disputed claim term" other than its plain and ordinary meaning. *Thorner v. Sony Computer Ent. Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012). Additionally, the Board may not "construe claims during [an *inter partes* review] so broadly that its constructions are unreasonable under general claim construction principles." *Microsoft Corp. v. Proxyconn, Inc.*, 789 F.3d 1292, 1298 (Fed. Cir. 2015).

Statements made during prosecution are relevant to understanding the meaning of claim terms and can give rise to prosecution history estoppel or prosecution disclaimer. Nevertheless, because prosecution history "often produces ambiguities created by ongoing negotiations between the inventor and the PTO, . . . the doctrine of prosecution disclaimer only applies to unambiguous disavowals." *Shire Dev., LLC v. Watson Pharm., Inc.*, 787 F.3d 1359, 1366 (Fed. Cir. 2015).

Petitioner proposes constructions for several claim phrases, namely: "video tripwire" (claims 1–29), "virtual tripwire" (claims 25–26), "calibration" (claims 1–6, 25, 28–29), "calibrating" (claims 26–27), "input means" (claims 1–6, 25), "output means" (claims 1–6, 25), "at least one virtual tripwire has been crossed" (claims 26–27), and "virtual tripwire crossing" (claims 26–27). *See, e.g.*, Pet. 8–12. In its Preliminary Response, Patent Owner proffered a construction for "video tripwire," "virtual tripwire," "at least one virtual tripwire has been crossed," and "virtual

tripwire crossing." *See* Prelim. Resp. 22–36. Patent Owner also contended that the remaining terms identified by the Petitioner should be construed according to their "plain and ordinary meaning." *Id.* at 35–36.

In our Decision on Institution, we determined that only "video tripwire" and "virtual tripwire" required construction and only to the extent to determine whether these terms exclude alarm regions or area-based detection systems as argued by Patent Owner. Dec. on Inst. 12. In its Response, Patent Owner again proposes a construction for the terms "video tripwire" recited in claims 1–29, "virtual tripwire" recited in claims 25–27, and also proffers a construction for "a computer system . . . for performing calibration" as recited in claims 1 and 25. PO Resp. 15–33. Patent Owner states that no other construction is material to resolving the Petition. *Id.* at 33–34.

For this Final Written Decision, we provide constructions for the terms "video tripwire", "virtual tripwire," "computer system . . . for performing calibration and for gathering and processing data based on video output received from the sensing device," "input means," and "output means."

1. "video tripwire" and "virtual tripwire"

Petitioner and Patent Owner both agree that the terms "video tripwire" (claims 1–29) and "virtual tripwire" (claims 25, 26) are synonymous as they are used interchangeably in the specification and claims, but each proffer a different construction for the terms (referred collectively as "video tripwire"). *See* Pet. 8; PO Resp. 15.

Petitioner contends that video tripwire should be construed as "an element of any type in a video image that can be monitored to detect the

crossing of objects." Pet. 8 (citing Ex. 1002 ¶¶ 63–65; Ex. 1001, Abstract, 9:4–15, 9:24–25, 9:34–36). Patent Owner responds that video tripwires "do not include alarm regions or area-based detection systems" and that the broadest reasonable interpretation of video tripwire is "a line boundary on an image or video that when traversed by a representative portion of a detected object, can trigger alarms or events." PO Resp. 18 (citing 9:6–9, 9:12–14, 9:24–35, 10:31–33, Fig. 11; Ex. 2005, 16–17); *see generally id.* at 15–31.

Patent Owner further contends that the video tripwire described by the '083 patent can be a "mathematical line having zero width" "(i.e. not containing any pixels)" and can "represent a one dimensional ('1D') zero-width boundary. *Id.* at 8 (citing Ex. 2005, 16; Ex. 1013 ¶ 55; Ex. 2014 ¶ 38); *see also id.* at 27 (stating Petitioner mischaracterizes the '083 patent "by arguing line tripwires are not 1D"); *see also e.g., id.* at 43 (distinguishing Autoscope by stating "[u]nlike area-based tripwires like those in *Autoscope*, line based tripwires are 1D. Thus as an area-based system, *Autoscope* functions in a fundamentally different way than the claimed line-based tripwires and does not teach a tripwire that is "a line boundary on an image or video that when traversed by a representative portion of a detected object, can trigger alarms or events") (citations omitted); *see also id.* at 27 (stating that area-based systems are dependent upon an analysis of an area comprised of pixels).

Patent Owner further asserts "tripwires and area-based systems" are "fundamentally different." PO Resp. 8 (citing Ex. 1013 ¶ 55). Patent Owner asserts that tripwires are distinguishable from any of the prior art area-based system "as the focus is no longer testing pixels within a designated area to

determine whether an object is found within an area." *Id.* (citing Ex. 1013 ¶ 155; Ex. 2014 ¶ 38).

We disagree with Patent Owner's arguments that the broadest reasonable interpretation of "video tripwire" excludes alarm regions or area-based detection systems that test pixels within a designated area to determine whether an object is within that area. We also disagree with Petitioner's arguments that a tripwire must be a one dimensional line.

First, a construction of a video tripwire as excluding area-based systems is inconsistent with the specification of the '083 patent and the ordinary and customary meaning of the term as would be understood by one of ordinary skill in the art. For example, the '083 patent itself indicates that the term video tripwire—which is used interchangeably with virtual tripwire (*see, e.g.*, Ex. 1001, 2:60–62)—encompasses alarm regions and area-based detection systems. The '083 patent cites to U.S. Patent No. 5,801,943 (Ex. 1022, "Nasburg '943") and U.S. Patent No. 5,696,503[9] (collectively "Nasburg"), as disclosing "the concept of a video trip wire." Ex. 1001, 2:37–47. The video tripwires disclosed in Nasburg '943 encompasses alarm regions and area-based detection systems. For example, Nasburg '943 describes "tripwire sensors" as images of a loop that are electronically placed over areas on a roadway video to detect the crossing of vehicles in the video. Ex. 1022, 1:33–38. Nasburg '943 further states that a "video processor determines how many vehicles pass through the designated area by detecting changes within a detection box (image of a loop) as a vehicle

[9] Neither party submitted a copy of U.S. Patent No. 5,585,503 as an exhibit into the record.

passes through it." *Id.* at 1:38–41. Therefore, we find that the '083 patent explicitly refers to video tripwires as encompassing area-based systems.

Patent Owner states that the '083 patent does not cover area-based tripwires because "the '083 patent explicitly differentiated its invention from Nasburg." PO Resp. 16 (citing Ex. 1001, 2:43–51). We disagree with this argument because the '083 patent does not differentiate the Nasburg references on the basis of area-based versus line-based tripwires. Rather, the '083 patent asserts the Nasburg references track and detect vehicles, while the '083 patent detects both rigid (e.g., vehicles) and non-rigid (e.g., human) objects. Additionally, the '083 patent states that Nasburg references mentions the "concept" of a video tripwire but does not disclose how to implement such a tripwire. Specifically, the '083 patent states:

> Nasburg deals with the tracking of vehicles using multiple sensors, including video sensors. "Finger prints" are developed for vehicles to be tracked and are used to subsequently detect the individual vehicles. While Nasburg does mention the concept of a video tripwire, there is no disclosure as to how such a video tripwire is implemented. Nasburg further differs from the present invention in that it is focused exclusively on detecting and tracking vehicles. In contrast, the present invention, as disclosed and claimed below, is aimed toward detecting arbitrary moving objects, both rigid (like a vehicle) and non-rigid (like a human).

Ex. 1001, 2:40–52. Therefore, we find the citations to the Nasburg references in the '083 patent support our construction that the term "video tripwire" does not exclude area-based systems.

We also note that Nasburg's use of "tripwire" as encompassing area-based systems is consistent with how the term "tripwire" is used by others in

the art. For example, various papers and reports describe the "area-based"[10] Autoscope System as a "trip-line based system." A report prepared by the Washington State Transportation Center describes Autoscope as a "tripwire imaging system." Ex. 1017, 28. Another report prepared by the Texas Transportation institute describes Autoscope as a "trip-wire" system that uses "a narrow line of pixels across a traffic image to detect passing vehicles." Ex. 1018, 33. A paper published in The Journal of Intelligent Transportation Systems states that in "trip-line based systems [such as Autoscope], count and speed detectors are used to measure traffic volumes, vehicle speeds." Ex. 1021, 5, 9, Fig. 1. Thus, we find that our construction of video tripwire as not excluding area-based systems also is consistent with how the term is used in the art.

Patent Owner asserts that other portions of the '083 patent support a construction of video tripwire that excludes area-based systems or requires the tripwire to be a one dimensional line[11]. *See*, *e.g.*, PO Resp. 3, 8–9, 13, 15, 18, 22 (citing Ex. 1001, 1:58–61, 2:56–59, 5:38–46, 9:6–9, 9:12–14, 9:24–35, 10:31–33, 10:63–67, Fig. 11). We have reviewed each of the cited portions of the '083 patent identified by the Patent Owner and determine that none of the cited material supports a construction of video tripwire that

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[10] Patent Owner asserts that the Autoscope System, which is described in one of the asserted references "is not a line based tripwire system," but rather is an "area-based system" that uses zone-based detectors. PO Resp. 36

[11] Patent Owner describes a one-dimensional line as a "mathematical line having zero width (i.e. not containing any pixels)." PO Resp. 8 (citing Ex. 1013 ¶ 55), 27 (citing Ex. 1013 ¶¶55–61 as explaining the concept of a tripwire as a 1D line with zero width).

excludes area-based systems or requires the tripwire to be a one dimensional line.

For example, Patent Owner cites to column 2, lines 56 through 59, and column 9, lines 25 through 35 to support its argument that the tripwire of the ’083 patent “is not confined to the shape of a *straight* one-dimensional line and could be curved” and that the ’083 patent uses a “line-based detection algorithm.” PO Resp. 3, 21–22 (citing Ex. 1001, 2:56–59, 9:25–35; Ex. 2014 ¶ 35) (emphasis added). These cited portions of the ’083 patent do not limit video tripwire to a one dimensional line or discuss line-based detection algorithms. Rather, these portions of the ’083 patent merely state that a goal of the invention is to combine advantages of tripwires with those of video surveillance systems (Ex. 1001, 2:25–35) or that embodiments of the invention “may include different types of tripwires,” including tripwires that are curved, follow a contour of a region, are a multi-segment tripwire, comprise multiple parallel tripwires that require an object to cross all of the tripwires in a particular order (Ex. 1001, 9:24–35).

Patent Owner also asserts that the ’083 patent describes a line-based technique in which a user clicks on one end of a line [x1, y1] and then drags the pointer to the other end of a line [x2, y2] and then “software solves for the values of *m* and *b* in the equation for a straight line . . for example, $y = mx + b$.” PO Resp. 8–9 (citing Ex. 2014 ¶ 39; Ex. 1001, 5:38–46). Patent Owner asserts that if “a given pixel of an object is [x,y], and y is less than mx + b, then the pixel is on one side of the line; if y is greater than mx + b, then the pixel is on the other side.” *Id.* at 8 (citing Ex. 2014 ¶ 39).

Column 5, lines 38 through 46 of the ’083 patent, however, merely describes a figure that illustrates “analysis system 5 coupled to

communication medium 2 and to user interface 6" and states the analysis system comprises various components including a receiver, computer system, and memory and that the receiver has means for performing demodulation, decoding, etc. Ex. 1001, 5:35–46. We find that this discussion in the '083 patent does not support Patent Owner's assertions nor disclose a line-based technique in software solving for $y = mx + b$. Therefore, Patent Owner has not pointed to a teaching in the '083 patent sufficient to limit the broadest reasonable interpretation of video tripwire to require the tripwire be a one-dimensional line.

We further find that none of the other cited portions of the '083 patent support a construction of video trip wire that exclude area-based systems or requires the tripwire to be a one dimensional line. *See, e.g.,* Ex. 1001, 1:58–61 (discussing conventional physical tripwires as, *inter alia,* extending only in straight lines), 9:6–9 (stating that a user may superimpose one or more lines of interest on an image and these "lines will serve as one or more tripwires"), 9:12–14 (stating in one embodiment the tripwire is on the ground in the image), 9:24–35 (stating that embodiments of the invention "may include different types of tripwires," including tripwires that are curved, follow a contour of a region, are a multi-segment tripwire, comprise multiple parallel tripwires that require an object to cross all of the tripwires in a particular order), 10:31–33 (describing Figure 11 and stating the location of a foreground object is then tested (step 741) to determine if it overlaps a line representing a tripwire (step 742)), 10:63–67 (discussing use of secondary "dummy" wires on either side the actual tripwire to determine the direction of a tripwire crossing by determining in what order the secondary tripwires are crossed when the actual tripwire is crossed).

Although some of these citations may describe the video tripwire of preferred embodiments as a line, the citations do not evidence a clear intent to redefine a video tripwire as excluding area based systems or limit a tripwire to a *one-dimensional* line. Rather, the ’083 patent states a user may “superimpose one or more lines of interest on the image; these lines will serve as one or more tripwires,” thereby indicating that tripwires are not limited to one dimensional lines of zero width. *See* Ex. 1001, 9:6–8; *see also* Ex. 1001, 12:19–30 (stating the illustrated embodiments are “not intended to limit the broad aspect of the invention”); *id.* at 4:52–56 (stating that the invention is not intended to be limited to the specific terminology used to describe the preferred embodiments).

Patent Owner further relies upon statements made during prosecution of the parent application that issued as the ’945 patent and during the reexamination of the ’083 patent to support its argument that the ’083 patent involves a “line-based detection algorithm” and is not an area-based detection system. *See, e.g.*, PO Resp. 1, 4, 18, 20–21 (citing Ex. 2005, 16, 17), 28–31 (citing Ex. 1013, 46, 48–50, 52, 53, 55). We have reviewed these statements and determine that these statements do not support the narrow construction of video tripwire proposed by Patent Owner. We find that these statements are not clear or unambiguous disavowals that would result in a disclaimer of claimed subject matter.

For example, Patent Owner quotes excerpts from the following statement made during prosecution of the related ’945 patent and contends this statement “explicitly defined” video tripwire to not include “area/region-based” tripwires (*see* PO Resp. 18, 20–21):

> Second, an alarm region as in Olson et al. [cannot] represent a linear boundary (e.g., a border or a perimeter). In other words, virtual tripwires may be used to define regions, but alarm regions [cannot] define a virtual tripwire.

Ex. 2005, 16–17.

We do not find this these sentences sufficient to constitute a clear or unambiguous disclaimer of "area/region-based systems" or limit video tripwires to a one dimensional line."

Patent Owner also states that to the extent it is not clear from the '083 patent and the prosecution history that the claim term video tripwire cannot cover area/region-based tripwires like those in the asserted prior art, Patent Owner clarified the scope of its invention during reexamination. *See, e.g.*, PO Resp. 24, 28–31.

We disagree with this argument because the Patent Office did not accept Patent Owner's statements or determine that any of the claims under reexamination were patentable.

When granting the Request for *Inter Partes* Reexamination, the USPTO found the Request established a reasonable likelihood that the requester would prevail with respect to claims 1–29 of the '083 patent. Ex. 1010, 12. The USPTO found that the Request raised numerous issues of unpatentability, including unpatentability over references that are asserted in present proceeding. *See*, *e.g.*, *id.* at 5–11. The Reexamination was dismissed pursuant to 35 U.S.C. § 317(b) without a decision on the merits, however, because Patent Owner and the requesting party settled their civil action and entered a stipulated agreement. *See* Ex. 1016, 3–5 (dismissing Reexamination based on an Order of Dismissal entered by the district court

as a result of a stipulated agreement between Patent Owner and Bosch that Bosch did not sustain their burden of proving invalidity of any of the claims under reexamination); 35 U.S.C. § 317(b) ("Once a final decision has been entered against a party in a civil action arising [under 35 U.S.C. § 1338] that the party has not sustained its burden of proving the invalidity of any patent claim in suit . . . then . . . an inter partes reexamination requested by that party . . . may not thereafter by maintained by the Office"). As such, the USPTO never indicated any change from its position that there was a reasonable likelihood that claims 1–29 are unpatentable over area-based art, including art asserted in the present proceeding.

Therefore, for the foregoing reasons and based on the full record, we do not construe "video tripwire" or "virtual tripwire" as excluding area-based detection systems, as argued by Patent Owner. Nor do we construe "video tripwire" or "virtual tripwire" as limited to a one dimensional line having zero width. Nor do we expressly adopt Petitioner's proposed construction, or provide further construction of the terms video tripwire or virtual tripwire, because further construction of the terms are unnecessary to resolve the issues in dispute.

2. "computer system . . . for performing calibration"

Petitioner contends the phrase "a computer system, including a user interface, for performing calibration" should not be construed as a means plus function limitation under 35 U.S.C. § 112 ¶ 6[12] because the claims do

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[12] We refer to the pre-AIA version of 35 U.S.C. § 112, which recites an "element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the

not recite "means" and because one skilled in the art would understand "computer system" to have sufficient structure. *See*, *e.g.*, Pet. 10–11, 52. Nevertheless, Petitioner contends that if the "computer system . . . for performing calibration" phrase of claims 1 and 25 are construed under § 112 ¶ 6, then the phrase should be construed as a structure that performs (1) the manual calibration embodiment described at column 6, lines 39 through 56 and shown in Figure 11 of the '083 patent (Pet. 26 (citing Ex. 1002 ¶¶ 137–141)) or (2) the automatic calibration embodiment described at column 7, lines 14 through 57 and shown in Figure 8 of the '083 patent (Pet. 56 (citing Ex. 1002 ¶¶ 317–322). In its Preliminary Response, Patent Owner did not opine on whether the "computer system" phrases should be construed under § 112 ¶ 6, instead merely stating that "'calibration' (claims 1–6, 25, 28–29) should be given [its'] plain and ordinary meaning." Prelim. Resp. 35. In our Decision on Institution, we did not expressly discuss whether "computer system. . . for performing calibration" should be construed under 35 U.S.C. § 112 ¶ 6. Dec. on Inst. 16.

In its Response, Patent Owner asserts the "computer system for . . . performing calibration" limitations of claims 1 and 25 should be construed as means plus function elements. PO Resp. 32. Patent Owner asserts the structure of these elements is a processor that executes one of the three calibration algorithms disclosed in the '083 patent, including both the (1) manual calibration method and (2) automatic calibration method

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corresponding structure, material, or acts described in the specification and equivalents thereof".

identified by Petitioner. PO Resp. 31–33 (citing, *inter alia*, Ex. 1001, 6:39–59; 7:14–57, Figs. 6, 8).

We agree with Patent Owner that the "computer system for . . . performing calibration" limitations of claims 1 and 25 should be construed according to § 112, sixth paragraph. In determining whether a claim term invokes § 112 ¶ 6, "the essential inquiry is not merely the presence of absence of the word 'means' but whether the words of the claim are understood by persons of ordinary skill in the art to have a sufficiently definite meaning as the name for structure." *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2015). The failure to use the word "means" creates a rebuttable presumption that § 112 ¶ 6 does not apply. *Id.* If, however, it is shown that "the claim term fails to recite sufficiently definite structure or else recites function without reciting sufficient structure for performing that function," this presumption may be rebutted. *Id.* (citations omitted).

That is the case here. The claim terms at issue recite the function "performing calibration" but do not recite sufficient structure for performing that function because the claimed calibration function cannot be achieved by any general purpose computer or computer system without special programming. *See Aristocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008) (stating that for a computer-implemented function, other than a generic function such as processing, receiving, or storing, the corresponding structure is a special purpose computer or processor programmed to implement the algorithm for performing the function disclosed in the specification). As result, the structure corresponding to a "computer system . . . for performing calibration" is not

simply a general purpose computer system by itself but rather a system having a special purpose computer programmed to perform the disclosed algorithm. *See Aristocrat*, 521 F.3d at 1333 (stating that to claim a means for performing a specific computer-implemented function and then to disclose only a general purpose computer as the structure designed to perform that function amounts to pure functional claiming).

As such, we conclude that the "computer system for performing calibration" limitation fails to recite sufficiently definite structure and that the presumption against means-plus-function claiming is rebutted and find that this limitation is subject to the provisions of 35 U.S.C. § 112 ¶ 6.

Construing a means-plus-function claim term is a two-step process. *Williamson*, 792 F.3d at 1351. We must first identify the claimed function. *See id.* Then, we must determine what structure, if any, disclosed in the specification corresponds to the claimed function. *See id.* Having found that the term "computer system for performing calibration" is subject to the application of § 112 ¶ 6 and having identified the function recited in the claim (calibration), we next determine what structure, if any, disclosed in the specification corresponds to the claimed function. *See id.*

For a computer-implemented function, other than a generic function such as processing, receiving, or storing, the corresponding structure is a special purpose computer or processor programmed to implement the algorithm for performing the function disclosed in the specification. *See Aristocrat*, 521 F.3d at 1333. The algorithm may be expressed as a mathematical formula, in prose, or as a flow chart, or in any other manner that provides sufficient structure. *Williamson*, 792 F.3d at 1352.

On a full record, we interpret "computer system . . . for performing calibration" as a processor for executing at least one of the three calibration methods disclosed in the '083 patent at column 6, line 39 through column 7, line 57 and at Figures 6–8, and their equivalents. For the purposes of this Decision, only the (1) manual calibration method and (2) the automatic calibration method are relevant.

Both parties agree that the '083 patent describes algorithms for executing these two calibration methods but the parties describe the algorithms for performing the calibration functions slightly differently. *Compare* Pet. 26–27, 56–57, *with* PO Resp. 32–33.

In describing the manual calibration method, an embodiment of which is shown in Figure 6, the '083 patent states a user enters parameters relating to the sensing device. Ex. 1001, 6:39–42. "These parameters may include, *for example*," focal length and angle of the sensing device and the height of sensing device from the ground. *Id.* at 6:42–45 (emphasis added). The system generates visual feed and then presents the visual feedback to the user. *Id.* at 6:45–49. The visual feedback provides scale information (e.g., the size of the person or other object of interest relative to its surroundings) that helps to verify that the calibration is correct; the user then decides if the appearance of the visual feedback is acceptable or if the parameters need to be adjusted; if the feedback is acceptable, the process is finished; otherwise, the process loops back for entry of new parameters. *Id.* at 6:49–56. In sum, based on our reading of the '083 patent we interpret the algorithm for performing the manual calibration method as:

1. Receiving parameters relating to the sensing device;
2. Generating visual feedback; and

3. If visual feedback is accepted, finish the process, otherwise loop back to receive new parameters relating to the sensing device.

In describing the automatic calibration method shown in Figure 8, the ’083 patent states video information is gathered by a sensing device over an extended period of time. *Id.* at 7:14–18, Fig. 8 (step 721B). After the data is gathered, objects are then segmented out for analysis. *Id.* at 7:18–19, Fig. 8 (step 722B). Histograms are then generated for the objects in various regions of the image. *Id.* at 7:19–21, Fig. 8 (step 723B). Step 724B of Figure 8 states the average size of person in the image regions is then determined and step 725B states the size of the person in different image regions is used to calibrate. *Id.,* Fig. 8. The ’083 patent further explains that segmentation step (722B) is shown in Figure 10 and includes three steps, namely pixel-level background modeling (step 7221), foreground detection and tracking (step 7222), and object analysis (7223). In sum, based on our reading of the ’083 patent, we interpret the algorithm for performing the automatic calibration function as:

1. Gathering video information from a sensing device;
2. Segmenting out objects;
3. Generating histograms of object in image regions;
4. Determining average size of object in image regions; and
5. Using the size of the object in different image regions to calibrate.

3. “computer system . . . for gathering and processing data based on video output received from the sensing device”

Petitioner contends the phrase “a computer system . . . for gathering and processing data based on video output received from the sensing device”

should not be construed as a means plus function limitation under 35 U.S.C. § 112 ¶ 6 because the claims do not recite "means" and because one skilled in the art would understand "computer system" to have sufficient structure." *See*, *e.g.*, Pet. 10–11, 52. Nevertheless, Petitioner contends that if the "computer system . . . for gathering and processing data" phrase of claims 1 and 25 is construed under § 112 ¶ 6, then the gathering and processing data functions are described at 10:28–33 and in steps 740 and 742 of Figure 11 (Pet. 28, 52).

Patent Owner does not address if the "computer system for . . . gathering and processing data" phrase should be interpreted under 35 U.S.C. § 112 ¶ 6. Nor does Patent Owner provide a construction for this phrase in its Motion to Amend under § 112 ¶ 6. *See generally* Mot. to Amend.

We agree with Petitioner that this phrase should not be construed under § 112 ¶ 6. The function recited in the claim is gathering and processing data based on video output received from the sensing device. Gathering and processing data is a generic function that can be performed by a general purpose computer. *See Aristocrat*, 521 F.3d at 1333 (stating that for a computer-implemented function, other than a generic function such as processing, receiving, or storing, the corresponding structure is a special purpose computer or processor programmed to implement the algorithm for performing the function disclosed in the specification).

4. "input means"

Petitioner argues that the "input means" recited in independent claims 1 and 25 is a means-plus-function limitation under 35 U.S.C. § 112 ¶ 6 whose function is inputting data and the corresponding structure in the Specification of the '083 patent is a mouse, a keyboard, a touch screen and a

graphical user interface. Pet. 12. Patent Owner does not dispute Petitioner's proposed construction.

We find the "input means" of claim 1 is a means-plus-function limitation under § 112 ¶ 6 because the claim uses the word "means," describes the function performed by the "means" and recites no structure for performing the function.

We adopt Petitioner's proposed construction and note that construction of this term is not material to resolving issues in dispute.

5. "output means"

Petitioner argues that the "output means" recited in independent claims 1 and 25 is a means-plus-function limitation under 35 U.S .C. § 112 ¶ 6 whose function is outputting data and the corresponding structure in the Specification of the '083 patent is a monitor, a printer, a display device, an alarm, an alerting device, and a graphical user interface. Pet. 11–12. Patent Owner does not dispute Petitioner's proposed construction. PO Resp. 33.

We find the "output means" of claim 1 is a means-plus-function limitation under § 112 ¶ 6 because the claim uses the word "means," describes the function performed by the "means" and recites no structure for performing the function.

We adopt Petitioner's proposed construction and note that construction of this term is not material to resolving the issues in dispute.

6. Other Claim Terms and Phrases

We determine that no further claim construction is required to resolve the issues in dispute. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) ("[O]nly those terms need be construed that

are in controversy, and only to the extent necessary to resolve the controversy.”).

D. Overview of the Asserted Art

1. Autoscope

Autoscope (Ex. 1003), titled “Autoscope™ 2004 Supervisor User Guide” is a user guide that provides information about the hardware and software that make up the Autoscope System. Ex. 1003, 1, 11. The Autoscope System is a traffic surveillance management system, comprising computer hardware, software, and cabling, that detects, calculates, and collects traffic data, such as vehicle presence and passage, vehicle speed, and incident detection. *Id.* at 18–19. In the Autoscope System, “[a]n image sensor, or camera, transmits live video signals to an Autoscope machine vision processor (MVP) that processes the images.” *Id*. at 20. “The MVP then records the results of its analysis” and the results “are available to human operators (through the Supervisor application) for further analysis.” *Id.*

The Supervisor application of the Autoscope System is used to “create detector layouts” that will direct the MVP how to monitor and collect traffic data at that location. *Id.* at 22, 24. The detector layouts are drawn by the user over a location on a video or still image of the camera feed. *Id.* at 22. The detector layouts appear as a line, box, or arrow. *Id.* at 22, 159. Each shape represents a detector type, calculation, or function, and specifies how the MVP monitors and collects traffic data at that location. *Id*. at 159.

For example, “Count detectors” are used to determine the total number of vehicles detected during a set time interval and appear as straight lines that lie perpendicular to a lane of traffic. *Id.* at 175. “Presence

detectors" are used to identify "the presence of a vehicle in the field of view" with "high accuracy." *Id.* at 176. Presence detectors can also be used to process an image to detect vehicles travelling in the wrong direction or detect when vehicles are stopped. *Id.* "Presence detectors look like Count detectors (straight lines)" but "typically lie parallel to the flow of traffic." *Id.* at 177. If directional capability is assigned to a detector, an arrow appears at the end of the detector and the detector will turn on only for vehicles moving in the direction the arrow points. *Id.*

2. *Winter*

Winter is a U.S. Patent titled "Video Information Management System Which Provides Intelligent Responses to Video Data Content Features." Ex. 1004, [54]. Winter discloses an intelligent video information management ("IVIM") system that includes video cameras 520, and video analysis and storage units 518, and a Video Recorder/PC ("VR/PC") unit that has motherboard 580, front end video processing and video data compression hardware 582, and a screen display. *Id.* at 15:33–16:4, 17:53-64, Figs. 1A, 155. The screen display is "of the type that may be presented to the user in connection with setting parameters for executing a "'perimeter violation' image analysis tool." *Id.* at 62:37–39; Figs. 90A-D, 155. The screen display "permit[s] the user to adjust parameters of an image analysis algorithm which determines whether a perimeter boundary has been crossed by a moving object." *Id.* at 14:1–4; Fig. 155. A "drawing element (such as a box or line)" is "displayed over a video image." *Id.* at 62:39–42. The drawing element "is indicative of a perimeter of an area in the scene represented by the video signal, the purpose of the image analysis algorithm being to detect entry of objects into the indicated area." *Id.* at 62:41–45.

When the "user indicates that the parameter setting is done," "end points of the line or box indicating the perimeter 1966 are determined . . . and the endpoints are then saved as parameters indicative of the perimeter location." *Id.* at 62:53–57. If an object in the video feed, such as a person, crosses the perimeter, an "image analysis algorithm" detects that crossing and generates a response, such as the sounding of an alarm. *Id*. at 62:40–46, 64:27–61.

3. Olson

Olson, titled "Moving Object Detection and Event Recognition Algorithms for Smart Cameras," is a report that was included in "Proceedings of Image Understanding Workshop" reportedly held in May 1997. Ex. 1005, 3, 4. Olson describes "algorithms for the core computations needed to build smart cameras" that can analyze video and detect moving objects and recognize events, such as a person entering or exiting a scene. *Id.* at 14, 17–20, Fig. 2. Olson states the algorithms make up an "Autonomous Video Surveillance (AVS) system . . . for moving object detection and event recognition." *Id.* at 14. The system comprises smart cameras that communicate with a Video Surveillance Shell (VSS)." *Id.* at 21. "The VSS [] allows the user to specify alarm regions and conditions. Alarm regions are specified by drawing them on the map and using a mouse." *Id.* at 21. Olson's system "learns the image to-world mapping by watching humans move around in the scene." *Id.* at 26. "Changes in the apparent size and position of humans in the image provide information about the existence and depth of world surfaces." *Id.*

4. Togashi

Togashi is a Japanese Unexamined Patent Application Publication titled "Image Monitoring Device" that describes a device for detecting intruding objects, such as people, in a monitoring region. Ex. 1007, 2, 5. The device includes, *inter alia*, a "filming means [such as a camera] for filming an image in a monitoring region", and "a detection means for processing the [digitized] image" and "detecting intruding objects in the monitoring region," "wherein at least one linear area for detecting intruding objects is set on the image in the monitoring region, and intruding objects are detected by changes in the image in this linear area." *Id.* at 3.

E. Asserted Anticipation of Claims 1–29 by Autoscope

Petitioner contends claims 1–29 are anticipated under § 102(b) by Autoscope and argues Autoscope discloses each and every limitation of the challenged claims. Pet. 24–54. Patent Owner opposes. *See generally* PO Resp. Having considered the parties contentions and supporting evidence, we determine Petitioner has demonstrated by a preponderance of the evidence that Autoscope anticipates claims 1–29 of the '083 patent.

1. Independent Claims 1, 7, 12, 25, 26, and 28

a. video tripwire (claims 1, 7, 12, 25, 26, and 28)

Preamble language that merely states the purpose or intended use of an invention generally is not treated as limiting the scope of a claim. *See Boehringer Ingelheim Vetmedica, Inc. v. Schering–Plough Corp.*, 320 F.3d 1339, 1345 (Fed. Cir. 2003). When the limitations in the body of the claim rely upon or derive essential structure from the preamble, however, then the preamble acts as a necessary component of the claimed invention and is

limiting. *See Eaton Corp. v. Rockwell Int'l Corp.*, 323 F.3d 1332, 1339 (Fed. Cir. 2003).

The preamble of claims 1 and 25 recites a "video tripwire comprising," the preamble of claim 7 recites a "video tripwire user interface comprising," the preamble of claims 12 and 26 recites a "method of initializing a video tripwire system," and the preamble of claim 28 recites "a video tripwire apparatus comprising." Petitioner contends Autoscope discloses the preamble of each independent claim because Autoscope discloses full traffic surveillance management system that uses video tripwires, which "appear as line, box, or arrow shapes that overlay a region of a video or still image" to generate traffic measurements. Pet. 24 (citing Ex. 1003, 18, 193, 195, 199–200, 203–204).

Patent Owner responds that Autoscope does not disclose the "require[d] line-based 'video tripwire'" because Autoscope is an "area-based system that uses tripwires made of zones rather than lines." *Id.* at 39; *see also id.* at 3 ("all of the prior art identified in the Petition is limited to teaching alarm *regions* and/or alarm *areas* rather than tripwires. Tripwires are fundamentally different in both form and substance from regions and areas."); *see generally* PO Resp. 39–44.

We disagree with Patent Owner's argument. As stated above in Section II.C.1., we do not construe video tripwire as excluding area-based systems. Therefore, we disagree with Patent Owner's argument that Autoscope does not disclose line-based video tripwires. We agree with Petitioner and find that Autoscope discloses traffic management system that that uses machine-vision technology to produce highly accurate traffic measurements. Pet. 24; Ex. 1003, 18. Autoscope's tripwires "appear as line,

box, or arrow shapes that overlay a region of a video or still image" and generate these measurements. Ex. 1003, 159.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses the preambles of independent claims 1, 7, 12, 25, 26, and 28.

b. a sensing device producing video output (claims 1, 25); apparatus adapted to be coupled to a sensing device, said sensing device to produce video output (claim 28)

Petitioner contends that Autoscope's image sensor or video camera, which "transmits live video signals to an Autoscope machine vision processor (MVP) that processes the images" discloses the "sensing device producing video output" limitations recited in claims 1 and 25 and similarly recited in claim 28 (an "apparatus adapted to be coupled to a sensing device, said sensing device to produce video output"). Pet. 24–25 (citing Ex. 1002 ¶¶ 132–134; Ex. 1003, 20).

Patent Owner does not dispute these contentions. *See generally* PO Resp. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378. We have reviewed the parties' arguments and evidence and agree with Petitioner and find that Autoscope discloses the "sensing device producing video output" recited in claims 1 and 25 and an "apparatus adapted to be coupled to a sensing device, said sensing device to produce video output" recited in claim 28.

c. *a computer system, including a user interface, for performing calibration (claims 1, 25) / said apparatus including a user interface, said apparatus adapted to perform calibration (claim 28)*

As stated above in Section II.C.2., we construe the "computer system . . . for performing calibration" phrase recited in claims 1 and 25 as a means-plus function limitation. Petitioner contends that under such a construction, Autoscope discloses a processor for performing the manual calibration method recited in the ’083, and thus discloses the means plus function calibration limitation of claims 1 and 25 and similar limitations recited in claim 28. Pet. 26–27. Petitioner states that Autoscope provides a calibration prompt, requiring a user to enter the sensing device parameter, namely camera height. Ex. 1003, 150. Autoscope presents the user with visual feedback of the camera’s view. Ex. 1003, 154. The user may adjust the camera height and gridlines. *Id.*

Patent Owner responds that Autoscope’s specialized algorithm for camera calibration does not disclose the manual calibration algorithm of the ’083 patent because Autoscope’s algorithm (1) does not require focal length, camera angle, or any parameters other than camera height and (2) requires drawing a calibration grid, which is not is taught by the ’083 patent. PO Resp. 47–48 (citing Ex. 2014 ¶ 57).

We disagree with Patent Owner’s argument. The ’083 patent states the sensing parameters "*may include*, *for example*" a number of sensing parameters but does not require any particular parameter. Ex. 1001, 6:41–45 (emphasis added). Moreover, the challenged independent claims do not require the specific parameters as argued by Patent Owner. Because the ’083 patent states the listed sensing parameters are examples and does not require that any particular parameter be used, we disagree that algorithm for manual

calibration requires entering use of the exemplary sensing device parameters. Nor does the '083 patent preclude other types of information from being received.

Based on the record before us, we find Autoscope discloses a processor that executes the first two steps of the algorithm for performing manual calibration, or its equivalent, by (1) receiving a user entered camera height (a sensing device parameter) and (2) generating visual feedback by presenting the user with visual feedback of the camera's view. *See, e.g.,* Ex. 1003, 154. We also find Autoscope discloses the third step of the algorithm for manual calibration by looping back to receive new parameters relating to the sensing device by allowing the user to adjust the camera height and, if no further adjustments are made, finishing the calibration processes. *Id.*

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses calibration limitations recited in claims 1, 25, and 28.

d. *a computer system . . . for gathering and processing data based on video output received from the sensing device (claims 1, 25) / obtaining data from the sensing device (claim 26) / said apparatus . . . to gather and process data based on video output received from the sensing device (claim 28)*

Petitioner contends Autoscope discloses this limitation as recited in claims 1 and 25 and similarly recited in claims 26 ("obtaining data from the sensing device"), 28 (apparatus adapted to . . . gather and process data based on video output received from the sensing device"). *See, e.g.*, Pet. 27–28. For example, Petitioner asserts Autoscope's MVP gathers and processes video signals from the video camera and reports them to a user interface in

the Supervisor software. *Id.* at 28; Ex. 1003, 20. Patent Owner does not dispute Petitioner's contentions regarding these limitations. *See generally* PO Resp. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses the limitations regarding gathering and processing data recited in claims 1, 25, 26, and 28.

e. the user interface comprising input means and output means, said input means including a graphical user interface, wherein the computer system displays processed data (claims 1, 25, 28)

Petitioner contends Autoscope's disclosure of a computer having a GUI that displays a "particular camera's roadway image" as well as a mouse and keyboard used for operator selection teaches the input means of claims 1, 25, and 28. Pet. 31 (citing Ex. 1003, 26, 128, 369). Patent Owner does not dispute Petitioner's contentions regarding these limitations. *See generally* PO Resp. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses the user interface having input and output means required by claims 1, 25, and 28.

f. entering parameters

Petitioner asserts that Autoscope allows the user to enter "detection parameters, such as detector lengths and coordinates of key points" and thus discloses the "entering parameters" recited in claim 12. Pet. 40 (citing Ex. 1003, 146–148, 206). Patent Owner does not dispute Petitioner's contentions regarding this limitation. *See generally* PO Resp. Nonetheless, the burden

remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses "entering parameters" as required by claim 12.

g. graphical user interface adapted to enable a user to draw a video tripwire on at least one of a video image of said video output or a snapshot taken from said video output (claims 1, 7, 28) / wherein the computer system includes software permitting a user to enter at least one virtual tripwire (claim 25) / initializing the system including entering at least one virtual tripwire (claim 26)

Petitioner contends Autoscope's Supervisor Workstation, which allows users to draw video tripwire "detectors" over a particular camera's roadway image in the Camera window, teaches the limitations relating to drawing or entering a video tripwire required by claims 1, 7, 12, 25, 26, 28. *See* Pet. 32 (citing Ex. 1003, 36, 128; Ex. 1002 ¶¶ 151–154).

Other than arguing Autoscope does not disclose a video tripwire, Patent Owner does not dispute Petitioner's contentions regarding these limitations. *See generally* PO Resp. We disagree with Patent Owner's argument regarding "video tripwire" because this argument replies upon its proposed construction of "video tripwire", a construction that we do not adopt as discussed above in Section II.C.1.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses the graphical user interface and software that allows a user to enter a video/virtual tripwire on a video image as required by claims 1, 7, 12, 25, and 26.

h. *the video tripwire comprising at least one of a curved video tripwire, a multi-segment video tripwire, and a multiple parallel video tripwire (claim 25) / said at least one virtual tripwire comprising at least one of a curved tripwire, a multi segment tripwire, and a multiple parallel tripwire (claim 26)*

Petitioner contends Autoscope's teaching of combining multiple presence detectors parallel to each other discloses a video tripwire comprising a multiple parallel video tripwire as recited by claim 25 and similarly by claim 26. Pet. 46–47 (citing Ex. 1003, 165, 169, 172). Patent Owner does not dispute Petitioner's contentions addressing these limitations. *See generally* PO Resp. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses the limitations requiring a video or virtual tripwire comprising a multiple parallel video tripwire as required by claim 25 and 26.

i. *analyzing the data obtained from the sensing device to determine if the at least one virtual tripwire has been crossed; and triggering a response to a virtual tripwire crossing (claim 26).*

Petitioner contends Autoscope discloses presence and count detectors that are used to determine whether a vehicle has "crossed" under a detector. Pet. 48–49 (citing Ex. 1002 ¶¶ 268–272; Ex. 1003, 165, 176, 198, 201–203). Petitioner relies on the testimony of its declarant, Dr. Papanikolopoulos, to support its position. Dr. Papanikolopoulos testifies that Autoscope's presence detectors may be set to detect every time a vehicle passes under the detector. Ex. 1002 ¶¶ 270–271 (citing Ex. 1003, 176, 198, 201–203).

Patent Owner responds that because Autoscope is "an area based system," Autoscope determines whether an object is within an area, not

whether a virtual tripwire, or any boundary, has been crossed. PO Resp. 51 (citing Ex. 2014 ¶ 61). Patent Owner asserts that detecting whether an object is "within" the area of interest is not the same thing as detecting a crossing. *Id.* (citing Ex. 2014 ¶ 61).

We disagree with Patent Owner's argument. As stated above in Section II.C.1., we do not construe a video tripwire as excluding area-based systems that determine if an object is within an area. Additionally, we disagree that detecting if an object is within the area of interest is not the same thing as detecting a crossing because the '083 patent expressly states that "an object is determined to cross a tripwire if the bottom portion of the object *overlaps* a tripwire line." Ex. 1001, 9:19–21 (emphasis added); *see also id.* Fig. 11 (step 742), 10:35–36 ("an object is determined to *cross* a tripwire if the bottom portion of the object *overlaps* a tripwire line") (emphasis added).

We find that Autoscope discloses "presence detectors" and "count detectors" that are drawn over the image of roadway and are used to detect the crossing of vehicles. *See, e.g.*, Ex. 1003, 128. These detectors can appear as, *inter alia,* a line or box. *Id.* at 159. Autoscope's count detectors are used to count vehicles that cross in a particular direction. Ex. 1003, 198, 201–202. Autoscope's presence detectors are used to "identify the existence of a vehicle in the field of view." *Id*. at 203. They may be set to "turn ON every time a vehicle passes under the detector" or to detect "vehicles traveling in the wrong direction." *Id*. at 176. Presence detectors may be placed parallel to each other in adjacent lanes so that "a vehicle that is changing lanes is more likely to cross under only one of the adjacently placed detectors." *Id*. at 165.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses limitations regarding analyzing data, determining of a tripwire has been crossed, and triggering a response as required by claim 26.

Therefore, based on the record developed during trial, we conclude that Petitioner has demonstrated by a preponderance of the evidence that the subject matter of independent claims 1, 7, 12, 25, 26, 28 are anticipated by Autoscope.

F. Asserted Anticipation of Dependent Claims 2–6, 11, 13–24, 27, and 29 by Autoscope

Petitioner contends Autoscope discloses the additional limitations in dependent claims 2–6, 11, 13–24, 27, and 29. Pet. 34–44, 49–51, 53–54. Other than arguments relating to the patentability of the independent claims, Patent Owner only presents arguments directed to the patentability of claims 11 and 19. PO Resp. 49–51. For the following reasons, we determine Petitioner has demonstrated by a preponderance of the evidence that Autoscope anticipates claims 2–6, 11, 13–24, 27, and 29 of the ’083 patent.

Claims 11, 19

Claim 11, which depends from claim 7, further requires that the "graphical user interface is further adapted to enable a user to enter at least one video event rule." Claim 19, which depends from claim 12, further requires the entering "of at least one video event rule."

Petitioner asserts that drawing of presence and count detectors on Autoscope's GUI discloses entering the video event rules as required by claims 11 and 19. Pet. 38–39 (citing Ex. 1002 ¶¶ 181–184; Ex. 1003, 21, 186, 195, 204–205). Patent Owner responds that the Petition fails to identify

where Autoscope discloses a "user interface that allows a user to enter video event rules" as required by claim 11 or the actual entering of a video event rule as required by claim 19. PO Resp. 49–50.

Upon consideration of the arguments and evidence of record, we disagree with Patent Owner and find Autoscope's disclosures relating to count detectors and presence detectors teach the video event rule limitations of dependent claims 11 and 19.

The '083 patent states that a video event rule "may comprise a prescribed action (such as a 'human' crossing a 'virtual tripwire' in a prescribed direction) and a prescribed response (such as logging the alert with text and video to a database and sending an e-mail to a particular email address)." Ex. 1001, 10:5–10. "Video event rules may encompass more complex activities involving other virtual video features, such as areas of interest, along with other classes of activities, such as loitering, leaving a bag behind, or stealing an item, and other types of response, such as activating a Digital Video Recorder (DVR) or sounding an audible alarm." *Id*. at 10:10–15.

We find that counting vehicles moving in a particular direction (count detectors) and identifying the presence of a vehicle in the field of view (presence detectors) comprise a "prescribed action" and that transmitting an alarm to the Supervisor workstation or "extend[ing] a call to the controller" or constitutes "prescribed responses." *See* Ex. 1003, 21, 176 (stating presence detectors can detect stopped vehicles and also stating that when certain conditions are met, such as when three vehicles are in the left lane, the MVP "outputs a signal to the traffic controller").

We also find that Autoscope teaches how to enter both count detectors and presence detectors on Autoscope's graphical user interface through use of a mouse. *See* Ex. 1003, 195 (describing, *inter alia,* how to add and edit count detector parameters on a GUI, such as by drawing a count detector parallel to a stop bar or double clicking on a left mouse button); *id.* at 204–205 (describing how to add presence detectors to a GUI layout by, *inter alia*, "click[ing] on the down arrow icon at the top of the Camera window," click on "Presence" shown in the list box, then place the pointer at a position where you wish to begin drawing the detector line and drag the pointer to the place where you wish the detector line to end); *see also id.* at 177 (describing how to add presence detectors to the GUI layout); *id.* at 186–187 (describing how to add Speed Alarms to the GUI layout).

Therefore, based on the record developed during trial, we conclude Petitioner has demonstrated by a preponderance of the evidence that the subject matter of claims 11 and 19 are anticipated by Autoscope.

Claims 2–6, 13–18, 20–24, 27, and 29

Petitioner provides detailed evidence and argument that Autoscope discloses each of the limitations of claims 2–6, 13–18, 20–24, 27, and 29. *See* Pet. 34, 37, 40, 44, 49, 51, 53, 54. Patent Owner presents no arguments separately directed to the patentability of claims these claims. We have reviewed the record and the parties' arguments and determine that Petitioner sufficiently identifies disclosure in Autoscope corresponding to the additional limitations of claims 2–6, 13–18, 20–24, 27, and 29. *Id.*

Therefore, based on the record developed during trial, we conclude that Petitioner has demonstrated by a preponderance of the evidence that the

subject matter of claims 2–6, 13–18, 20–24, 27, and 29 __ are anticipated by Autoscope.

G. Asserted Obviousness of Claims 1–6, 25, 28, and 29 over Autoscope and Togashi

Petitioner contends that claims 1–6, 25, 28, and 29 would have been obvious over the combined teachings of Autoscope and Togashi. Petitioner contends that to the extent Autoscope does not teach the gathering and processing data based on video output received from a sensing device limitations recited in independent claims 1, 25, 26, 28, Togashi makes up for any deficiencies. Pet. 28–30 (citing Ex. 1007, 2–3, Figs. 1, 8; Ex. 1002 ¶¶ 128, 147), 45 (citing Ex. 1002 ¶¶ 129, 233–238), 53 (citing Ex. 2002 ¶¶ 128, 298–303. Specifically, Petitioner contends that Togashi teaches a more detailed algorithm for detecting when an object overlaps a line (tripwire) by comparing the pixel luminance of the line between a background image at time t=t0 and a new image at time t=t1, generating a difference value for each pixel, binarizing each pixel into "0" or "1" based on a predetermined threshold value, and determining that an object overlaps the line if the number of pixels on the line having the value "1" is greater than a threshold number. *Id.* at 30 (citing Ex. 1007, 4, Figs. 3(a), 3(b), 3(c), 3(d)). Petitioner further contends that it would have been obvious to combine the teachings of Togashi and Autoscope system to achieve the benefits of using Togashi's efficient algorithm (e.g., decreased computation time and data storage requirements) in Autoscope's similar system. *Id.* at 29–30 (citing, *inter alia,* Ex. 1007, 2–3; Figs. 1, 8; Ex. 1002 ¶¶ 128, 147).

Patent Owner argues that Togashi does not cure any deficiencies of Autoscope because Togashi "is also an area-based system" and therefore

does not "disclose the claimed tripwire." Prelim. Resp. 56–57. We disagree with Patent Owner's argument because it is based upon a claim construction of video tripwire that excludes area-based systems, which we did not adopt.

Patent Owner also argues that a POSITA would not combine Autoscope with Togashi because Togashi is directed to tracking a person while Autoscope is directed to tracking vehicles that move at a much faster rate. PO Resp. 44–45. We disagree. We agree with Petitioner and find that both Autoscope and Togashi disclose video based surveillance systems that analyze video to determine when an object crosses a virtual tripwire in the image and tha Togashi provides a specific exemplary embodiment how to make that determination. Pet. 29. We also agree with Petitioner and find that Togashi teaches monitoring tripwire pixels for overlap and states that its algorithm requires only a small amount of computation, time, and data storage capacity. *Id.* (citing Ex. 1007, 3). We are also persuaded by the testimony of Dr. Papanikolopoulos, that a POSITA would have been motivated to combine the teachings of Togashi and Autoscope to take advantage of the efficiencies of Togashi. Ex. 1002 ¶ 128. We determine that Petitioner has provided sufficient articulated reasoning with rational underpinning to establish that a person of ordinary skill in the art would have modified the teachings of Autscope in view of Togashi to achieve the benefits taught by Togashi, e.g., to reduce the amount of computation, time, and storage data needed. *See KSR*, 550 U.S. at 418.

On the present record, we determine Petitioner has shown sufficiently the combination of Autoscope and Togashi teaches or suggests the limitations of independent claims 1, 25, and 28 and has provided articulated reasoning with rational underpinning for combining the references.

Petitioner has also shown sufficiently that the combination teaches the limitations of dependent claims 2–6, which depend directly or indirectly from claim 1, and claims 27 and 29, which depend from claims 26 and 28 respectively, would have been obvious over the combined teachings of Autoscope and Togashi. Patent Owner makes no additional arguments with respect to these claims. Accordingly, having considered the parties contentions and supporting evidence, we determine Petitioner has demonstrated by a preponderance of the evidence that claims 1–6, 25, and 28–29 would have been obvious over Autoscope and Togashi.

H. Asserted Anticipation of Claims 1–25, 28, and 29 by Winter and Asserted Obviousness of Claims 1–6 and 25–29 over Winter and Olson

Petitioner contends that claims 1–25, 28, and 29 are anticipated under § 102(b) by Winter and that claims 1–6 and 25–29 are unpatentable under § 103(a) over Winter and Olson. Pet. 54–89. Patent Owner opposes. PO Resp. 52–58.

Having considered the parties contentions and supporting evidence, for the foregoing reasons, we determine that Petitioner has demonstrated by a preponderance of the evidence that Winter anticipates claims 7–24, 28, and 29 of the ’083 patent and that claims 1–6 and 25–29 are unpatentable over Winter and Olson. Petitioner has not demonstrated by a preponderance of the evidence that claims 1–6 and 25 are anticipated by Winter.

1. Independent Claims 1, 7, 12, 25, 26, and 28

a. video tripwire (claims 1, 7, 12, 25, 26, and 28)

The preamble of claims 1 and 25 recites a “video tripwire comprising,” the preamble of claim 7 recites a “video tripwire user interface comprising,” the preamble of claims 12 and 26 recites a “method of

initializing a video tripwire system," and the preamble of claim 28 recites "a video tripwire apparatus comprising." Petitioner contends that Winter discloses the preamble of each independent claim because Winter discloses a "perimeter violation" image analysis tool that is part intelligent video information system which detects significant features of an incoming video information stream, and takes appropriate action in response to detection of features of interest," such as the entry of an object into an area indicated by the perimeter. Pet. 54–55 (citing Ex. 1004, 2:23–27, 62:40–46).

Patent Owner responds that Winter does not teach the claimed "video tripwire" recited in each of the challenged claims. PO Resp. 52–58. According to Patent Owner, Winter is an "area-based system" that uses tripwires made of areas rather than lines and therefore does not disclose the claimed line-based tripwire system. *Id.* at 52; *see generally id.* at 52–58. We disagree with Patent Owner's argument. As stated above in Section II.C.1., we do not construe video tripwire as excluding area-based systems.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Winter discloses the preamble of independent claims 1, 7, 12, 25, 26, and 28.

b. a sensing device producing video output (claims 1, 25); apparatus adapted to be coupled to a sensing device, said sensing device to produce video output (claim 28)

Petitioner contends that Winter's video camera 520 is a "source of video data" and satisfies the "sensing device producing video output" limitations recited in claims 1 and 25 and similarly recited in claim 28 (an "apparatus adapted to be coupled to a sensing device, said sensing device to

produce video output”). Pet. 55 (citing Ex. 1002 ¶ 313; Ex. 1004, 3:33–39, Fig. 1A).

Patent Owner does not dispute these contentions. *See generally* PO Resp. We have reviewed the parties’ arguments and evidence and agree with Petitioner. Specifically, we find that Winter discloses the “sensing device producing video output” recited in claims 1 and 25 and an “apparatus adapted to be coupled to a sensing device, said sensing device to produce video output” recited in claim 28.

c. a computer system, including a user interface, for performing calibration (claims 1, 25) / said apparatus including a user interface, said apparatus adapted to perform calibration (claim 28)

Claim 28 recites apparatus including a user interface, said apparatus adapted to perform calibration (claim 28). Petitioner asserts Winter discloses this limitation because the computer system of Winter uses size and depth parameters to calibrate the system. Pet. 55 (citing Ex. 1004, 63:12–19; Ex. 1002 ¶¶ 314–15). Patent Owner does not dispute these contentions. *See generally* PO Resp. We have reviewed the parties’ arguments and evidence and agree with Petitioner and find that Winter discloses an apparatus including a user interface, said apparatus adapted to perform calibration as recited in claim 28.

As stated above in Section II.C.2., we construed the “computer system . . . for performing calibration” phrase recited in claims 1 and 25 as a means-plus function limitation. Petitioner provides insufficient argument that Winter discloses this limitation under this claim construction. *See* Pet. 55. Accordingly, we determine Petitioner has not shown by a preponderance of the evidence that Winter anticipates claim 1 and claim 25.

Petitioner asserts that if the "computer system . . . for performing calibration" limitations recited in independent claims 1 and 25 are construed as a means plus function limitation, then Olson teaches this limitation because Olson discloses the function of performing calibration using structure corresponding to the automatic calibration embodiment described at 7:14–57 and shown in Figure 8 of the '083 patent. Pet. 56. Petitioner asserts that a POSITA would have combined Olson's more advanced calibration process into the system of Winter to provide image-to-world mapping and enhance Winter's system. Pet. 58–60 (citing, *inter alia*, Ex. 1002 ¶¶ 111–115, 120, 124–127, 319, 323–324).

Patent Owner responds that Olson's specialized algorithm for camera calibration does not disclose the automatic calibration algorithm of the '083 patent because Olson because (1) Olson's calibration method requires both an image and a corresponding map for a "warp transformation" algorithm, which is not disclosed by the '083 patent, (2) Olson's method requires that the internal calibration parameters be known, which is not required by the '083 patent, and (3) Olson's camera roll angle is assumed to be zero, which is not a required assumption in the '083 patent.

We disagree with these arguments because they rely on alleged differences between the calibration method of Olson and the '083 patent. These differences, however, are not material to the algorithm for executing the automatic calibration method of the '083 patent.

Patent Owner also argues that Olson does not disclose the segmentation step of the automatic calibration method because Olson uses "simple background subtraction and does not segment out objects in images when differencing the foreground and background, as required" by the

automatic calibration method of the ’083 patent. PO Resp. 59–63 (citing Ex. 1005, 161, 171; Ex. 2014 ¶ 80). We disagree with this argument because we find that Olson does disclose the required segmentation step.

As explained above in Section II.C.2., we find that the algorithm for performing the automatic calibration function disclosed in the ’083 patent requires:

1. Gathering video information from a sensing device;
2. Segmenting out objects;
3. Generating histograms of object in image regions;
4. Determining average size of object in image regions; and
5. Using the size of the object in different image regions to calibrate.

We find Petitioner has shown that Olson discloses each of these steps of the automatic calibration algorithm. For example, Petitioner has demonstrated persuasively that Olson gathers video information from a sensing device because the image from the video camera of Olson is portioned into a grid and each square of the grid is associated with a histogram that builds up a sample distribution for the apparent height of a human that passes through that location of the image, as required by the first step of the algorithm disclosed in the ’083 patent. Pet. 56 (citing Ex. 1005, 27).

Petitioner also has persuasively demonstrated that Olson segments out objects, as required by the second step of the algorithm disclosed in the ’083 patent. Pet. 56–57. Olson explains that “[p]rior to activation of the monitoring system, an image of the background…is captured to serve as the *reference image*” and that while in operation, the difference between the reference image and current video frame is “thresholded at an appropriate

value to obtain a binary image in which the 'off' pixels represent background pixels, and the 'on' pixels represent 'moving object' pixels." Ex. 1005, 17 (emphasis original). We disagree with Patent Owner's argument that Olson does not teach this segmentation step because Olson uses "simple background subtraction and does not segment out objects in images when differencing the foreground and background, as required" by the automatic calibration method of the '083 patent. PO Resp. 59–63 (citing Ex. 1005, 161, 171; Ex. 2014 ¶ 80). Rather, we find that by segmenting pixels into "off" pixels that represent background pixels and "on" pixels that represent moving objects, Olson discloses the segmenting step described in the '083 patent. *See* Ex. 1001, 8:27–42 (citing Olson in connection with the segmenting step).

Olson also discloses generating histograms of object in image regions, as required by the third step of the algorithm disclosed in the '083 patent. Olson generates a histogram for each of the 6x16 regions in the image. Ex. 1005, 27. Figure 10 displays the histogram, in which the "pixel intensity corresponds to the median observed height for the corresponding location" and "[d]ark grey pixels are those for which no observations were recorded." *Id.*

Olson also determines the average size of object in image regions. Olson's histogram includes pixel intensities that correspond to the median height of a person in that region, as required by the fourth step of the algorithm disclosed in the '083 patent. Ex. 1005, Fig. 10 (stating "Cell intensity is the median of the image heights of the observed humans when their feet were imaged in the cell. Dark grey regions contain no data.") Figure 11 of Olson depicts a "depth map" that is superimposed on the image

that is created using the height data of Figure 10 and converting it into depth. *Id.* at 27, Fig. 11.

Olson also uses the size of the object in different image regions to calibrate because it uses the depth of each region, which was obtained through the height data, to provide an image-to-world mapping, as required by the fifth step of the algorithm disclosed in the ’083 patent. Ex. 1005, 26–27.

Therefore, we find Petitioner has shown by a preponderance of the evidence that the combined disclosures of Winter and Olson teach a “computer system . . . for calibrating” as recited in claims 1 and 25.

We further find Petitioner has provided articulated reasoning with rational underpinning for combining the teachings of Winter and Olson. We disagree with Patent Owner that a POSITA would not combine the teachings of Winter and Olson because they have “different implementations.” PO Resp. 64. Petitioner has shown persuasively that a POSITA would have combined Olson’s more advanced calibration method with Winter’s teachings to provide image to world mapping and enhance the operation of Winter’s system. Pet. 58–60 (citing Ex. 1002 ¶¶ 124, 127, 324). Winter recognizes the benefits of knowing the real world size of objects within the video scene. *See* Ex. 1004, 63:12–32 (recognizing size as a relevant parameter for the perimeter violation detection tool). We agree with Petitioner that this disclosure of Olson would have motivated a POSITA to employ Olson’s method, which represents object sizes more accurately, in Winter. *See* Ex. 1002 ¶ 324.

For the foregoing reasons, we find Petitioner has not shown by a preponderance of the evidence that Winter discloses the calibration

limitations recited in claims 1 or 25, but has shown by a preponderance of the evidence that Winter discloses the calibration requirements of claim 28.

We also find Petitioner has shown by a preponderance of the evidence that the combined disclosures of Winter and Olson teach the calibration limitations of claims 1 and 25.

d. a computer system . . . for gathering and processing data based on video output received from the sensing device (claims 1, 25) / obtaining data from the sensing device (claim 26) / said apparatus . . . to gather and process data based on video output received from the sensing device (claim 28)

Petitioner contends Winter discloses the "computer system . . . for gathering and processing data based on video output" limitation as recited in claims 1 and 25 and similarly recited in claims 26 ("obtaining data from the sensing device"), 28 (apparatus adapted to . . . gather and process data based on video output received from the sensing device"). *See, e.g.*, Pet. 60–62. Petitioner asserts that Winter discloses the gathering and processing limitations of the independent claims. We agree with Petitioner that Winter's Video Recorder/PC ("VR/PC") unit possesses "video data compression and recording techniques," "performs data management, routing and analysis functions," and "implements unique user interface features that make the unit's capabilities conveniently available for selection and operation by the user" Pet. 60 (citing Ex. 1004, 17:53–64). Patent Owner does not dispute Petitioner's contentions regarding these limitations. *See generally* PO Resp. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses the limitations regarding gathering and processing data recited in claims 1, 25, 26, and 28.

e. "entering parameters"

Petitioner asserts that Winter allows users to set parameters for execution of a "perimeter violation" image analysis too. Pet. 83 (citing Ex. 1004, 62–33–65; Ex. 1002 ¶ 449). Winter states that an interface may be presented to the user "in connection with setting parameters for execution" of a perimeter violation image analysis too. Ex. 1004, 62:37–39. Patent Owner does not dispute Petitioner's contentions regarding this limitation. *See generally* PO Resp. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Autoscope discloses "entering parameters" as required by claim 12.

f. the user interface comprising input means and output means, said input means including a graphical user interface, wherein the computer system displays processed data (claims 1, 25, 28)

Petitioner contends Winter's disclosure of a GUI engine that interprets signals that were input using a computer mouse by a user using a mouse and generates objects to be displayed on a display monitor discloses the user input means and output required by claims 1, 25, and 28. Pet. 64 (citing Ex. 1004, 58:47–52; Ex. 1002 ¶¶ 332–334). Patent Owner does not dispute Petitioner's contentions regarding these limitations. *See generally* PO Resp. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Winter discloses the graphical user interface and software that allows a user to enter a video/virtual tripwire on a video image as required by claims 1, 25, and 28.

g. graphical user interface adapted to enable a user to draw a video tripwire on at least one of a video image of said video output or a snapshot taken from said video output (claims 1, 7, 28) / wherein the computer system includes software permitting a user to enter at least one virtual tripwire (claim 25) / initializing the system including entering at least one virtual tripwire (claim 26)

Petitioner contends Winter discloses "a screen display of the type that may be presented to the user in connection with setting parameters for execution of a 'perimeter violation' image analysis tool." Pet. 65–66 (citing Ex. 1004, 62:37–39); *see* Ex. 1004, Fig. 155; Ex. 1002 ¶¶ 335–336. Petitioner contends Winter's video tripwire is drawn onto the display in a two-step process. First, "a drawing element (such as a box or line) which is indicative of a perimeter of an area in the scene represented by the video signal" is displayed over the video image. *Id.* (citing Ex. 1004, 62:40–46). Second, "the user is permitted to drag and/or stretch the perimeter element 1966" and can then save the perimeter element. *Id*. (citing Ex. 1004, 62:48-57). Petitioner further asserts that Winter includes the step of entering parameters such as entering multiple parallel trip wires or enter of the directionality tripwire rules. Pet. 75 (citing Ex. 1001, 9:3–8).

Other than arguing Winter does not disclose a video tripwire, Patent Owner does not dispute Petitioner's contentions regarding these limitations. *See generally* PO Resp. We disagree with Patent Owner's argument regarding "video tripwire" because this argument replies upon its proposed

construction of "video tripwire", a construction that we do not adopt as discussed above in Section II.C.1.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Winter discloses the graphical user interface and software that allows a user to enter a video/virtual tripwire on a video image as required by claims 1, 7, 12, 25, and 26.

h. the video tripwire comprising at least one of a curved video tripwire, a multi-segment video tripwire, and a multiple parallel video tripwire (claim 25) / said at least one virtual tripwire comprising at least one of a curved tripwire, a multi segment tripwire, and a multiple parallel tripwire (claim 26)

Petitioner contends Winter's perimeter element (1966) having parallel top and bottom pairs, discloses a video tripwire comprising a multiple parallel video tripwire as recited by claim 25 and similarly by claim 26. Pet. 73 (citing Ex. 1004, Fig. 155; Ex. 1002 ¶¶ 376–77). Patent Owner does not dispute Petitioner's contentions addressing these limitations. *See generally* PO Resp. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Winter discloses the limitations requiring a video or virtual tripwire comprising a multiple parallel video tripwire as required by claim 25 and 26.

i. analyzing the data obtained from the sensing device to determine if the at least one virtual tripwire has been crossed; and triggering a response to a virtual tripwire crossing (claim 26).

Petitioner contends Winter's "perimeter tool" tracks objects and tests their location to determine if the video tripwire overlap. Pet. 76 (citing

Ex. 1002 ¶¶ 396–367; Ex. 1004, 62:58–59, 68:11–17, Ex. 1001, 10:32–36, 10:56–67). Winter triggers an alarm (response) to the video crossing including flashing lights or sirens. *Id.* (citing Ex. 1004, 16:58–61, 64:27–61, 92:13, Fig. 155; Ex. 1002 ¶ 398–399).

Patent Owner responds that because Winter is "an area-based system," Winter determines whether an object is within an area, not whether a virtual tripwire, or any boundary, has been crossed. PO Resp. 51 (citing Ex. 2014 ¶ 61). Patent Owner asserts that detecting whether an object is "within" the area of interest is not the same thing as detecting a crossing. *Id*. (citing Ex. 2014 ¶ 61).

We disagree with Patent Owner's argument. As stated above in Section II.C.1., we do not construe a video tripwire as excluding area-based systems that determine if an object is within an area. Additionally, we disagree with Patent Owner that detecting whether an object is within the area of interest is not the same thing as detecting a crossing. The '083 patent expressly states that "an object is determined to *cross a* tripwire if the bottom portion of the object *overlaps* a tripwire line." Ex. 1001, 9:19–21 (emphasis added); *see also id.* at Fig. 11 (step 742), 10:35–36 ("stating an object is determined to *cross* a tripwire if the bottom portion of the object o*verlaps* a tripwire line") (emphasis added).

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Winter discloses the limitations regarding analyzing data, determining of a tripwire has been crossed, and triggering a response as required by claim 26.

j. Summary

For the foregoing reasons, and based upon a review of the full record, we find Petitioner has shown by a preponderance of the evidence that Winter discloses each and every limitation of independent claims 7, 12, 26 and 28 but has not shown by a preponderance of the evidence that Winter discloses each and every limitation of independent claim 1 and 25. Accordingly, we find Petitioner has shown by a preponderance of the evidence that independent claims 7, 12, and 28 are anticipated by Winter but has not shown by a preponderance of the evidence that claims 1 and 25 are anticipated by Winter.

2. Dependent claims 2–6, 8–11, 13–24, 27, and 29

Petitioner asserts that dependent claims 2–6, 8–11, 13–24, and 29 are anticipated by Olson and that dependent claims 2–6, 27, and 29 are unpatentable over Winter and Olson. Other than the arguments related to the patentability of the independent base claim, Patent Owner only presents arguments directed to the patentability of claims 11 and 19. *See generally* PO Resp. 52–66. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378. For the following reasons, we determine Petitioner has not demonstrated by a preponderance of the evidence that Winter anticipates claims 2–6 and of the ’083 patent, but has demonstrated by a preponderance of the evidence that Winter anticipates claims 8–11, 13–24, 27, and 29 of the ’083 patent and that claims 2–6 and 29 are unpatentable over Winter and Olson.

Claims 2–6

Claims 2–6 each depend directly or indirectly from claim 1 and thus incorporate all limitations of claim 1. As described above in Section II.H.1.,

we find Petitioner has not established by a preponderance of the evidence that claim 1 is anticipated by Winter. All of the Petition's deficiencies in the context of claim 1 carry through to dependent claims 2–6. Accordingly, we determine that Petitioner has not shown by a preponderance of the evidence that claims 2–6 are anticipated over Winter.

Claims 11, 19

Claim 11, which depends from claim 7, further requires that the "graphical user interface is further adapted to enable a user to enter at least one video event rule." Claim 19, which depends from claim 12, further requires the entering "of at least one video event rule."

Petitioner asserts Winter discloses the entry of various event rules and "alarm enunciating devices, such as flashing lights, sirens or the like," that may be triggered in response to the detection of an event. Pet. 82–84; Ex. 1004, 16:58–61; *see* Ex. 1002 ¶¶ 444–446. For example, Petitioner states that in "carrying out the perimeter detection violation algorithm of Figure 155, the controller DSP may "issue an event report to the motherboard, which may, in turn, declare an alarm condition." Pet. 83 (quoting Ex. 1004, 64:27–61; citing Ex. 1004, 92:1–3). Petitioner further asserts that, in Winter, "alarm events" may be employed after it has been determined that an object has crossed the perimeter. *Id*. (citing Ex. 1004, 68:23–44, Fig. 96).

Patent Owner responds that Winter does not teach the claimed "video event rules." PO Resp. 66–67. Patent Owner asserts that the Petition fails to identify where Autoscope discloses a "user interface that allows a user to enter video event rules" as required by claim 11 or the actual entering of a video event rule as required by claim 19. *Id.*

Upon consideration of the arguments and evidence of record, we disagree with Patent Owner and find Winter's disclosures relating to the perimeter detection violation algorithm depicted in Figure 155, including the issuance of "an event report" to the motherboard, which may, in turn, declare an alarm condition, disclose the video event rule limitations of dependent claims 11 and 19.

The '083 patent states that a video event rule "may comprise a prescribed action (such as a 'human' crossing a 'virtual tripwire' in a prescribed direction) and a prescribed response (such as logging the alert with text and video to a database and sending an e-mail to a particular email address)." Ex. 1001, 10:5–10. "Video event rules may encompass more complex activities involving other virtual video features, such as areas of interest, along with other classes of activities, such as loitering, leaving a bag behind, or stealing an item, and other types of response, such as activating a Digital Video Recorder (DVR) or sounding an audible alarm." *Id*. at 10:10–15.

Figure 155 of Winter depicts a screen display present to the user for setting parameters for execution of a "perimeter violation" image analysis tool. Ex. 1004, 62:37–39. The user may draw a box or a line on the image to indicate the "perimeter of an area." *Id.* at 62:39–46. Winter's "image analysis algorithm" is used to detect entry of objects into this area. *Id.* We find that Winter's "alarmed mode" in which recording occurs "only in the event an alarm condition is detected" discloses the video event rule of claims 11 and 19. *Id.* at 91:67–92:2. The detection of objects entering into the perimeter of the area constitutes a "prescribed action" and the recording of video in response to an object having entered that area constitutes

"prescribed responses." *See* Ex. 1004, 92:1–3 (each camera can be set to "alarmed" mode, which involves "recording only in the event an alarm condition is detected").

We also find that Winter discloses how user can enter the video event rule in a user interface. Figure 158 of Winter shows the different operating modes for the camera, which the user can manipulate by using the cursor to set the scheduled period of time for a selected operating mode. Ex. 1004, 91:56–62. The "alarmed mode" records video "only in the event an alarm condition is detected." *Id.*; *see also id*. at 68:23–44 (discussing how a "preselected analysis algorithm" is applied to a video signal stream if certain alarm events occur). Additionally, Figure 172 of Winter depicts a GUI showing a menu that is present to the user "to permit selection of an analysis algorithm to be applied to live incoming video streams, including allowing the user to set an alarm for a particular user-selected camera tool, such as the "perimeter tool", and time. *Id.* at 95:21–29, *see also id.* at 95:50–96:4 (stating that alarm conditions are based on "user-settable parameters").

Based on our review of the entirety of the record before us, we agree with Petitioner and find that Winter discloses limitations required by dependent claims 11 and 19.

Claims 8–10, 13–18, 20–24, 27, 29

Petitioner provides detailed evidence and argument that Winter discloses each limitation of claims 8–10, 13–18, 20–24, 27, and 29*. See* 54–66, 79–89Patent Owner presents no arguments separately directed to the patentability of claims these dependent claims. We have reviewed the record and the parties' arguments and determine that Petitioner sufficiently

identifies disclosure in Winter corresponding to the additional limitations of claims 8–10, 13–18, 20–24, 27, and 29. *Id.*

Therefore, for all of the foregoing reasons, based on the record developed during trial, we find (1) Petitioner has demonstrated by a preponderance of the evidence that claims 1–6 and 25–29 are unpatentable under 35 U.S.C. § 103(a) as obvious over Winter and Olson, (2) Petitioner has demonstrated by a preponderance of the evidence that claims 7–24, 28, and 29 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Winter, and (3) Petitioner has *not* demonstrated by a preponderance of the evidence that claims 1–6 and 25 are unpatentable over § 102(b) over Winter.

I. Asserted Obviousness of Claims 1–6, 25, and 28–29 over Winter, Olson, and Togashi

Petitioner argues that claims 1–6, 25, and 28–29 would have been obvious over the combination of Winter, Olson, and Togashi. Pet. 54–81. Petitioner contends that to the extent Winter does not teach the gathering and processing data based on video output received from a sensing device limitations recited in independent claims 1, 25, 26, and 28, Togashi makes up for any deficiencies. Specifically, Petitioner contends that Togashi teaches an algorithm for detecting when an object overlaps a line (tripwire) by comparing the pixel luminance of the line between a background image at time t=t0 and a new image at time t=t1, generating a difference value for each pixel, binarizing each pixel into “0” or “1” based on a predetermined threshold value, and determining that an object overlaps the line if the number of pixels on the line having the value “1” is greater than a threshold number. *Id.* at 62–64 (citing Ex. 1007, 4, Figs. 3(a), 3(b), 3(c), 3(d)). Petitioner further contends that it would have been obvious to combine the

teachings of Togashi with Winter and Olson to achieve the benefits of using Togashi's efficient algorithm (e.g., decreased computation time and data storage requirements) in Winter's similar system. *Id.* at 62–63 (citing, *inter alia*, Ex. 1007, 2–3; Figs. 6–8; Ex. 1002 ¶¶ 128, 331).

Patent Owner argues that the challenged claims are patentable because Winter, Olson, and Togashi are each area-based systems and, therefore, do not teach or suggest the video tripwire requirements of the challenged claims. We disagree. As discussed above in Section II.C.1., we do not construe video tripwire or virtual tripwire as recited in the claims to exclude area-based systems.

We have reviewed the parties' evidence and arguments and determine that Petitioner has persuasively shown that Togashi also teaches the gathering and processing data based on video output received from a sensing device limitations of independent claims 1, 25, 26, 28, and has provided articulated reasoning with rational underpinning for combining the teachings of Togashi with the combined teachings of Winter and Olson. Therefore, based on the record developed during trial, we conclude Petitioner has demonstrated by a preponderance of the evidence that claims 1–6, 25, and 28–29 are unpatentable under 35 U.S.C. § 103(a) as obvious over Winter, Olson, and Togashi.

J. Motion to Amend

Having concluded that claims 1–29 are unpatentable, we address Patent Owner's Contingent Motion to Amend.

In an *inter partes* review, amended claims are not added to a patent as of right, but rather must be proposed as a part of a motion to amend. 35 U.S.C. § 316(d). The Board must assess the patentability of the proposed

substitute claims without placing the burden of persuasion on the patent owner. *Aqua Prods., Inc. v. Matal*, 872 F.3d 1290, 1328 (Fed. Cir. 2017). Patent Owner's proposed substitute claims, however, must still meet the statutory requirements of 35 U.S.C. § 316(d) and the procedural requirements of 37 C.F.R. § 42.121. *See* "Guidance on Motions to Amend in view of *Aqua Products*" (Nov. 21, 2017).[13] Accordingly, Patent Owner must demonstrate (1) the amendment responds to a ground of unpatentability involved in the trial; (2) the amendment does not seek to enlarge the scope of the claims of the patent or introduce new subject matter; (3) the amendment proposes a reasonable number of substitute claims; and (4) the original disclosure sets forth written description support for each proposed claim. *See* 37 C.F.R. § 42.121.

In order to show an amendment does not introduce new matter, a motion to amend must set forth written description "support in the original disclosure of the patent for each claim that is added or amended." 37 C.F.R. § 42.121(b)(1); *see also* Guidance 2 (stating that "a motion to amend must set forth written description support . . . in relation to each substitute claim"). The test for compliance with the written description requirement of 35 U.S.C. § 112 is whether the disclosure of the application as originally filed reasonably conveys to those skilled in the art that, as of the filing date, the inventor had possession of the invention that is now claimed. *Ariad Pharms., Inc. v. Eli Lilly & Co*., 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc).

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[13] The guidance memorandum is publicly available at https://www.uspto.gov/sites/default/files/documents/guidance_on_motions_to_amend_11_2017.pdf.

"Possession" is shown by descriptive means such as words, structures, figures, diagrams, and formulas that set forth fully the claimed invention. *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1572 (Fed. Cir. 1997). "It is not sufficient for purposes of the written description requirement . . . that the disclosure, when combined with the knowledge in the art, would lead one to speculate as to modifications that the inventor might have envisioned, but failed to disclose." *Id*. "One shows that one is 'in possession' of the invention by describing the invention, with all its claimed limitations, not that which makes it obvious." *Id*. "[T]he hallmark of written description is disclosure . . . . [T]he test requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art." *Ariad*, 598 F.3d at 1351. Also, the claimed invention does not have to be described *ipsis verbis* in the specification to satisfy the written description requirement. *Union Oil Co. of Cal. v. Atl. Richfield Co*., 208 F.3d 989, 1000 (Fed. Cir. 2000).

Patent Owner seeks entry of proposed claims 30–58 as substitutes for claims 1–29. *See generally* Mot. to Amend; Reply to Opp. to Mot. to Amend. Petitioner opposes. *See generally* Opp. to Mot. to Amend. For the reasons that follow, we deny Patent Owner's Contingent Motion to Amend as to the entry of proposed substitute claims.

1. Analysis

Our analysis focuses on language added to proposed substitute independent claim 30, which is similar to original claim 1 but includes the following additional limitation:

> wherein the video tripwire comprises at least one line segment on the at least one of the video image and the snapshot,

> and the video tripwire is configured to allow *detection of a crossing of a tracked object from one side of the line segment to the opposite side of the line segment*.

Mot. to Amend, 22 (emphasis added). Comparable language is added to proposed substitute independent claims 36, 41, 54, 55, and 57, which are similar to original claims 7, 12, 25, 26, and 28 respectively. *See id.* at 24, 26–28.[14] Thus, all of the proposed substitute independent claims contain language directed to a video tripwire that can detect the crossing of a tracked object from one side a line segment to the opposite side of a line segment.

Patent Owner contends that this added claim language differentiates the proposed substitute claims over the asserted art because none of the asserted references require determining if a tracked object is on one side of the tripwire and then the other side of the tripwire. Reply 2; *see also* Motion to Amend 15 (stating the asserted art does not "disclose a video tripwire system that determines tripwire crossings by *tracking objects moving from one side of a line segment to another*") (emphasis added); *see also* Reply to Opp. to Mot. to Amend, 9–10 (stating Dr. Papanikolopoulos testified that [the asserted art does] not teach "determining whether a tripwire is tripped by monitoring whether an object *moves* from one side of a tripwire to the other. . . . Accordingly, proposed substitute claims 30–58 address the

[14] Proposed substitute claim 55 is similar to original claim 26 but adds language reciting "detect a crossing of a tracked object from one side of the of the curved line segment to the opposite side of the curved line segment, the multi-line segments to the opposite side of said multi-line segments, and the multiple parallel line segments to the opposite side of said multiple parallel line segments" and does not recite "determine if the at least one virtual tripwire has been crossed" as recited in original claim 26. *Id*. at 27.

grounds at issue in this trial and are patentable) (emphasis added)). **__verify quote**

During oral argument, counsel for Patent Owner clarified that, unlike the asserted art, the proposed substitute claims require *analysis of at least two frames*, such that in the first frame the object is seen on one side of the line and then in the second frame, the object is seen on the second side of the line. *See* Tr. 59:16–21 ([Q. D]o the amended claims require an analysis of at least two frames? So in the first frame you see the object on one side of the line and then you see the object in a second frame on the other side? [A] You would have to analyze at least two frames."). Counsel further explained that "none of the prior art discloses a tripwire where you monitor an object, it overlaps a tripwire and then moves to another location and monitors it throughout. None of the prior art does that." *Id.* at 47:22–48:4; *see also id.* at 28:13–29:6 (describing the Motion to Amend as covering security systems that don't require an object to "overlap" the tripwire but rather determine the location of a tracked object in relation to the tripwire).

In its Motion to Amend, Patent Owner cites to three separate sections of U.S. Patent Application 10/704,645 (Ex. 2013, "the '645 application"), which issued as the '083 patent and to its parent application, U.S. Patent Application No. 09/972,039 (Ex. 2011, "the '039 application"), to show written description support for the detection of a tracked object from one side of a tripwire line segment to another. Mot. to Amend, 6, 7, 11–13. The three cited portions of the specifications, with corresponding cites to the '083 patent, are reproduced below:

> (1) The objective of foreground detection and tracking 7222 is to combine the FG pixels into FG objects and to track them

> over a number of frames, to guarantee spatio-temporal consistency.

Ex. 2011, 121:11-12, Ex. 2013, 141:15–16; Ex. 1001, 8:18–21.

> (2) These objects are tracked using correlation methods over several frames to obtain reliable size information. Exemplary tracking techniques are discussed in, for example, commonly assigned co-pending U.S. patent application Ser. No. 09/694,712, entitled, "Interactive Video Manipulation," filed Oct. 24, 2000, and incorporated herein by reference in its entirety. See, also, e.g., Wren, C. R. et al., "Pfinder: Real Time Tracking of the Human Body," IEEE Trans. on Pattern Matching and Machine Intelligence, Vol. 19, pp. 780–784, 1997; Grimson, W. E. L. et al., "Using Adaptive Tracking to Classify and Monitor Activities in a Site," CVPR, pp. 22–29, June 1998; and Olson, T. J. and Brill, F. Z., "Moving Object Detection and Event Recognition Algorithm for Smart Cameras, IUW, pp. 159–175, May 1997. Each of these references is to be considered as being incorporated by reference herein in its entirety.

Ex. 2011, 121:16–122:4; Ex. 2013, 141:20–142:8; Ex. 1001, 8:28–42.

> (3) Returning now to FIG. 5, the step of calibration 72 is followed by a step of initializing the system 73. This step permits a user to enter various parameters relating to how the system will gather, respond to, and report data. First, a user may superimpose one or more lines of interest on the image; these lines will serve as one or more tripwires. The lines may be of any orientation and may be placed almost anywhere in the image; the exception is that the lines may not occur too close to image boundaries because the object (e.g., person) crossing the line must be at least partially visible on both sides of the line for detection to occur. In an illustrative embodiment, it is assumed that the tripwire is on the ground in the image; that is, detection occurs when the bottom portion of an object (e.g., a person's legs) crosses the line. In a more general embodiment, the user may set a height above the ground for each line.

Ex. 2011, 123:1–10, Ex. 2013, 143:4–1; Ex. 1001, 9:3–17.

Petitioner responds that the limitations requiring detection of a crossing of a tracked object from one side to the opposite side of the line segment to the opposite side of the line segment add new matter in violation of 37 C.F.R. § 316(d) and 37 C.F.R. § 42.121. Opp. to Mot. to Amend. 2–3. Specifically, Petitioner asserts that there is no support in the specifications for a system that determines that an object is located on one side of the line segment in a first frame of a video, and then must determine that the same object is located on the other side of the line segment in a second, later frame of the video. *Id.* at 4.

Having reviewed the three cited portions of the ’645 application and the ’039 application, we agree with Petitioner and determine that Patent Owner has not identified sufficient written description support for the amended claim language reciting a video tripwire that allows detection of a crossing of a tracked object from one side of the line segment to the opposite side of the line segment.

The original claims covered the embodiment shown in Figure 11 of the ’083 patent that determined if a tripwire was crossed by determining if the object overlapped the tripwire. *See* Ex. 1001, Fig. 11. Patent Owner attempts to narrow the claim language to exclude this embodiment and claim a narrower species that does not require an overlap of the tripwire, but rather determines if the tripwire has been crossed by first requiring detection of an object on one side of the tripwire and then detecting the object on the opposite side of the tripwire. We find that this narrower species of claim is not adequately supported by the cited specifications. *See Knowles Elecs. LLC v. Cirrus Logic, Inc.*, 883 F.3d 1358, 1366 (Fed. Cir. 2018) (stating a patent’s general disclosure of a broad genus does not necessarily support a

claim directed to a particular species within that genus, even if the claimed species is consistent with that genus). Patent Owner has not persuasively shown, by descriptive means such as words, structures, figures, diagrams, and formulas, that it was in possession of a system that detects crossing of a tripwire in two step process that first detects an object in relation to a line segment of a tripwire and then in a second step determines if the object has moved to the opposite side of the line segment. "It is not sufficient for purposes of the written description requirement . . . that the disclosure, when combined with the knowledge in the art, would lead one to speculate as to modifications that the inventor might have envisioned, but failed to disclose." *Lockwood*, 107 F.3d 1572. "One shows that one is 'in possession' of the invention by describing the invention, with all its claimed limitations, not that which makes it obvious." *Id*.

Patent Owner states that Petitioner admits the '083 patent (1) tracks objects and (2) discloses determining if an object is on one side of a line and the opposite side and, therefore, Patent Owner has shown it was in possession of the substance of the claim which "determines if a tracked object is on one side of the a line and then the other." Reply to Opp. to Mot. to Amend. 2–3 (citing Opp. to Mot. to Amend, 5; Ex. 1001, 8:18–21, 8:26–42, 9:3–17). We disagree. Patent Owner has not shown, and it does not appear Petitioner has admitted, that the specifications show tracking of the object as it relates to determining if the object is one side of a trip wire and then the other side. Rather, the specifications' discussion of "tracking" relates to tracking an object to for the purpose of object segmentation, and not for determining if the object has crossed from one side of the line to another.

Patent Owner asserts the Specification's disclosure that the tripwire not be placed too close to the image boundary (Ex. 1001, 9:6–17) "only makes sense if the system has to sense an object on one side of the tripwire, and *later*, on the other side of the tripwire to detect a crossing." Reply to Opp. to Mot. to Amend, 3. We do not find Patent Owner's argument persuasive. Rather, we agree with the testimony of Dr. Papanikolopoulos that a POSITA would have understood that a tripwire should not be near the boundary of an image for other reasons, including radial distortion, and image intensity variations. Ex. 1036 ¶¶ 26–28.

For the foregoing reasons, we find Patent Owner has not shown written description support for the proposed added claim language that requires detection of a tracked object from one side of a tripwire line segment to another. As such, we determine that proposed substitute claims 30–58 improperly introduces new matter under 35 U.S.C. § 316(d)(3) and 37 C.F.R. § 42.121(a)(2)(ii). Accordingly, Patent Owner's Contingent Motion to Amend is denied.

K. Patent Owner's Motion to Exclude

Patent Owner filed a Motion to Exclude (Paper 24,"PO Mot. Exc."), Petitioner filed an Opposition (Paper 26, "Pet. Opp. Mot. Exc."), and Patent Owner filed a Reply (Paper 28, "PO Reply Mot. Exc."). For the reasons that follow, we deny the motion in-part and dismiss the motion in-part as moot.

Patent Owner moves to exclude Exhibits 1030, 1033, and 1034, which were utilized during Dr. Bovik's deposition, as irrelevant and prejudicial because, *inter alia*, these exhibits were not cited by Petitioner in any of their filings or declarations and were not properly authenticated. PO Mot. Exc. 2–3 (citing Federal Rules of Evidence 402, 901). Patent Owner also moves to

exclude paragraphs 72, 95–101, 113–120, and 132 and "any reference to 1-dimensional lines" from Dr. Papanikolopoulous's Declaration in support of Petitioners' Opposition to Patent Owner's Motion to Amend (Ex. 1036) as irrelevant because the cited paragraphs "do not respond to Patent Owner's Motion to Amend" and should be considered an improper attempt to supplement the record with new testimony without authorization required under 37 CFR § 42.123(b). PO Mot. Exc. 3–7. Patent Owner also contends the Brill reference (Ex. 1037) should be excluded as irrelevant and highly prejudicial because the submission "is tantamount to identifying a new ground of unpatentability." *Id.* at 9.

Because we have not relied on Exhibits 1030, 1033, 1034, 1037, or the specified paragraphs of Exhibit 1036, we dismiss the motion as moot as it relates to these exhibits.

Patent Owner also objects to Petitioner's citations to Dr. Papanikolopoulos's Declaration in support of Petitioners' Opposition to Patent Owner's Motion to Amend (Ex. 1036) as an improper attempt to incorporate declaration arguments into the opposition brief to avoid page limits. PO Mot. Exc. 7–8. We disagree with this argument. Contrary to Patent Owner's characterization, the opposition brief provides a sufficient discussion of the cited portions of Dr. Papanikolopoulos's supplemental declaration and explains the significance of the testimony. In light of this, we conclude that Petitioner has not improperly incorporated by reference declaration testimony to avoid page limitations. Accordingly, we deny Patent Owner's motion to exclude Exhibit 1036 for improper incorporation by reference.

III. CONCLUSION

Based on the evidence and arguments, we find Petitioner has demonstrated by a preponderance of the evidence that:

Claims 1–29 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Autoscope;

Claims 1–6, 25, 28, and 29 are unpatentable under 35 U.S.C. § 103(a) over Autoscope and Togashi;

Claims 7–24, 28, and 29 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Winter;

Claims 1–6 and 25–29 are unpatentable under 35 U.S.C. § 103(a) over Winter and Olson; and

Claims 1–6, 25, 28, and 29 are unpatentable under 35 U.S.C. § 103(a) over Winter, Olson, and Togashi.

Based on the evidence and arguments, we find Petitioner has *not* demonstrated by a preponderance of the evidence that claims 1–6 and 25 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Winter.

We deny-in-part and dismiss-in-part Patent Owner's Motion to Exclude.

In addition, we find that proposed substitute claims 30–58 introduces new matter. Accordingly, Patent Owner's Motion to Amend is denied pursuant to 35 U.S.C. § 316(d)(3) and 37 C.F.R. § 42.121(a)(2)(ii).

IV. ORDER

Accordingly, it is:

ORDERED that claims 1–29 of U.S. Patent No. 6,970,083 are held to be unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Exclude is *denied-in-part* and *dismissed-in-part*;

FURTHER ORDERED that Patent Owner's Contingent Motion to Amend is *denied*; and

FURTHER ORDERED that, because this Decision is final, a party to the proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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EXHIBIT 8

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571-272-7822

Paper 32
Date: February 4, 2020

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION,
Petitioner,

v.

VLSI TECHNOLOGY LLC,
Patent Owner.

Case IPR2018-01035
Patent 7,268,588 B2

Before ROBERT J. WEINSCHENK, MINN CHUNG, and KIMBERLY McGRAW, *Administrative Patent Judges*.

CHUNG, *Administrative Patent Judge*.

DECISION
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

In this *inter partes* review, instituted pursuant to 35 U.S.C. § 314, Intel Corporation ("Petitioner") challenges the patentability of claims 1, 2, 4, and 17 (the "challenged claims") of U.S. Patent No. 7,268,588 B2 (Ex. 1001, "the '588 patent"), owned by VLSI Technology LLC ("Patent Owner"). This Final Written Decision is entered pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons discussed below, we determine Petitioner has shown by a preponderance of the evidence that claims 1, 2, 4, and 17 of the '588 patent are unpatentable.

II. BACKGROUND

A. Procedural History

On June 4, 2018, Petitioner filed a Petition (Paper 3, "Pet.") requesting *inter partes* review of claims 1, 2, 4, and 17 of the '588 patent. Patent Owner filed a Preliminary Response (Paper 7, "Prelim. Resp."). On February 5, 2019, we instituted an *inter partes* review of all challenged claims of the '588 patent based on all the grounds presented in the Petition. Paper 6 ("Dec. on Inst."), 40.

After institution, Patent Owner filed a Patent Owner Response (Paper 16, "PO Resp."), Petitioner filed a Reply to Patent Owner Response (Paper 18, "Reply"), and Patent Owner filed a Sur-reply (Paper 22, "Sur-reply"). An oral hearing was held on October 30, 2019, and a copy of the hearing transcript has been entered into the record. Paper 31 ("Tr.").

B. Related Matters

According to the parties, the '588 patent is the subject of the following district court litigation: *VLSI Technology LLC v. Intel*

Corporation, No. 5:17-cv-05671 (N.D. Cal. Oct. 2, 2017). Pet. 1–2; Paper 5, 2.

C. The '588 Patent

The '588 patent describes a level shifter circuit comprising a first circuit, a second circuit, and a protection layer. Ex. 1001, code (57). The '588 patent describes that the first circuit, upon receiving an input signal, switches first and second nodes to opposite states within a first voltage range. *Id.* In response to the switching of the first and second nodes, the second circuit switches third and fourth nodes to opposite states within a second voltage range. *Id.* The protection layer couples the first circuit to the second circuit via isolation paths, which keep the voltages at the first and second nodes within the first voltage range and the voltages at the third and fourth nodes within the second voltage range. *Id.* According to the '588 patent, such isolation allows using thin gate-oxide devices for speed in a circuit while extending the voltage range of the circuit beyond the maximum voltage permissible for any individual thin gate-oxide device used in the circuit. *Id.*

Figure 1 of the '588 patent is reproduced below.

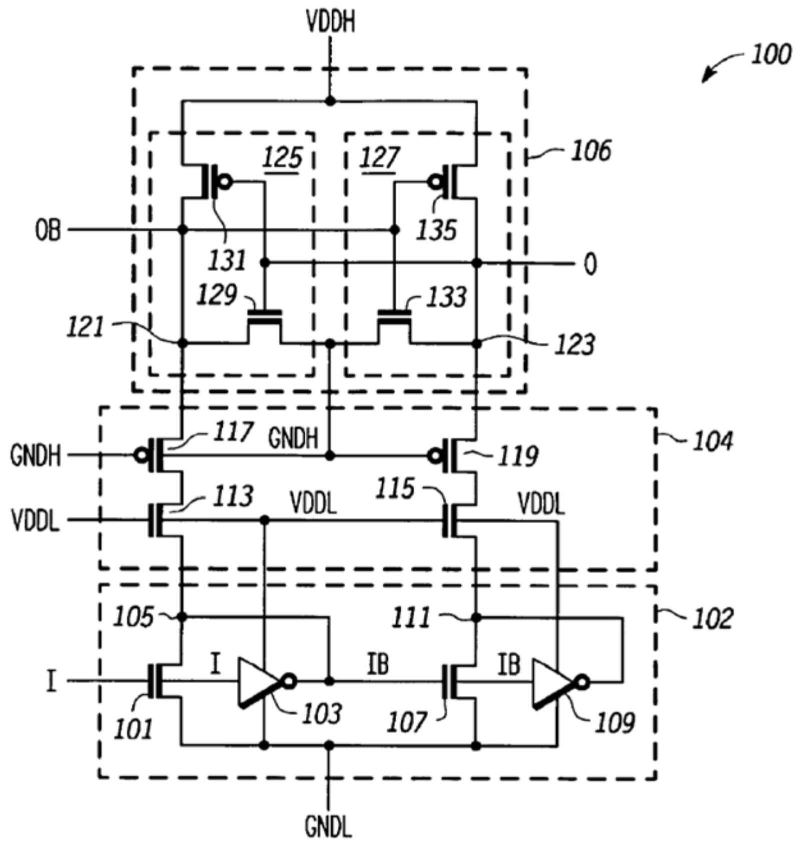

FIG. 1

Figure 1 is a schematic diagram of an exemplary up-shift circuit. *Id.* at 2:51–53.

As shown in Figure 1, up-shift circuit 100 comprises lower input circuit 102 coupled to protection layer 104, which, in turn, is coupled to upper output circuit 106. *Id.* at 2:53–55. As also shown in Figure 1, lower input circuit 102 comprises N-channel transistors 101 and 107 and inverters 103 and 109. *Id.* at 2:56–63, Fig. 1. The output of inverter 103 is coupled to node 105, which is, in turn, coupled to the drain of N-channel transistor 101. *Id.* at 2:60–61. Similarly, the output of inverter 109 is coupled to node 111, which, in turn, is coupled to the drain of N-channel transistor 107. *Id.* at

3:2–3. The output of inverter 103 is also coupled to the gate of N-channel transistor 107 and the input of inverter 109. *Id.* at 2:60–63.

As depicted in Figure 1, protection layer 104 comprises N-channel transistors 113 and 115 and P-channel transistors 117 and 119. *Id.* at 3:4–10, Fig. 1. The ’588 patent describes that N-channel transistors 113 and 115 are coupled to P-channel transistors 117 and 119, respectively, such that the drain of each N-channel transistor (i.e., transistor 113 or 115) is tied to the drain of its paired P-channel transistor (i.e., transistor 117 or 119, respectively). *Id.* at 3:8–10. The sources of P-channel transistors 117 and 119 are coupled to nodes 121 and 123, respectively, of upper circuit 106. *Id.* at 3:10–13.

According to the ’588 patent, because a voltage of VDDL is applied to the gates of N-channel transistors 113 and 115, protection layer 104 prevents the voltage of lower circuit 102 (e.g., the voltages at nodes 105 and 111) from exceeding VDDL. *Id.* at 4:36–38. P-channel transistors 117 and 119, on the other hand, receive a voltage of GNDH at their gates, which prevents the voltage of upper circuit 106 (e.g., the voltages at nodes 121 and 123) from falling below GNDH. *Id.* at 4:38–41.

The ’588 patent describes that upper circuit 106 includes a pair of crossed-coupled inverters 125 and 127 such that the output of one inverter is coupled or tied to the input of the other inverter in the pair and vice versa. *Id.* at 3:21–34. The outputs of inverters 125 and 127 are coupled to nodes 121 and 123, respectively. *Id.* at 3:22–27.

Regarding the operation of up-shift circuit 100, the ’588 patent describes that an input signal I is provided to the gate of N-channel transistor 101 and to the input of inverter 103 at lower input circuit 102. *Id.* at 2:56–

58, Fig. 1. According to the ’588 patent, the output signal O of up-shift circuit 100 is the signal (or the voltage) at node 123 of upper output circuit 106. *Id.* at 3:28–31, Fig. 1.

The ’588 patent describes that, in operation of up-shift circuit 100, the input signal I switches between GNDL and a voltage level at or near VDDL. *Id.* at 3:39–41. When the input signal I is low (i.e., at the voltage level of GNDL), the ’588 patent describes that transistors 101 and 107 and inverters 103 and 109 operate such that node 105 is pulled high (i.e., at the voltage level of VDDL) and node 111 is pulled low (i.e., at the voltage level of GNDL). *Id.* at 3:42–46. According to the ’588 patent, this in turn causes the transistors in protection layer 104 (with VDDL applied to the gates of transistors 113 and 115 and GNDH applied to the gates of transistors 117 and 119) and the transistors in upper output circuit 106 (with the sources of transistors 129 and 133 coupled together at GNDH and the sources of transistors 131 and 135 coupled together at VDDH) to operate in such a way that node 121 is high at VDDH and node 123 is low at GNDH. *Id.* at 3:54–65. Thus, when the input signal I is low at GNDL, the output signal O (at node 123) is low at the voltage level of GNDH. *Id.* at 3:64–66.

When the input signal I is high at VDDL, the ’588 patent describes that node 105 is pulled low at GNDL and node 111 is pulled high at VDDL, which causes node 121 pulled low at GNDH and node 123 (and the output signal O) pulled high at VDDH. *Id.* at 4:1–20. Thus, when the input signal I switches from GNDL to VDDL, the output signal O is switched from GNDH to VDDH. *Id.* at 4:15–20.

In summary, the ’588 patent describes that up-shift circuit 100 operates responsive to the input signal I to switch nodes 105 and 111 to

opposite states within the lower voltage range of GNDL to VDDL, which causes nodes 121 and 123, responsive to the switching of nodes 105 and 111, to switch to opposite states within the upper voltage range of GNDH to VDDH. *Id.* at 4:20–26.

In an embodiment, all of the transistors and the inverters of up-shift circuit 100 are or made of smaller thin-gate devices. *Id.* at 4:27–46. As used in the context of the ’588 patent, the term “thin-gate” refers to thin gate-oxide devices that are suitable for lower voltage ranges but are likely to break down if exposed to higher voltage levels. *Id.* at 1:33–35. According to the ’588 patent, thin-gate devices (such as 90-nm CMOS devices) are relatively fast but unable to withstand higher voltage levels, such as a range greater than 1.5 volts. *Id.* at 4:29–31, 1:19–26.

In an embodiment, the voltage difference or range of GNDL to VDDL is sufficiently large to enable the switching of the thin-gate devices but sufficiently small to protect each thin-gate device of lower circuit 102 from being exposed to excessive voltage levels. *Id.* at 4:31–35. Similarly, the voltage range of GNDH to VDDH in upper circuit 106 is sufficiently large to enable the switching of the thin-gate devices but sufficiently small to protect each thin-gate device of upper circuit 106 from being exposed to excessive voltage levels. *Id.* at 4:41–46.

As discussed above, protection layer 104 prevents the voltage of lower circuit 102 from exceeding VDDL and the voltage of upper circuit 106 from falling below GNDH, thereby keeping the voltage of lower circuit 102 within the voltage range of GNDL to VDDL and the voltage of upper circuit 106 within the voltage range of GNDH to VDDH. *Id.* at 4:36–41. In an embodiment, VDDH is greater than VDDL and GNDH is greater than

GDDL such that the voltage level across the entire up-shift circuit 100, i.e., GNDL to VDDH, can exceed the allowable maximum voltage of any individual thin-gate device in the circuit because none of the thin-gate devices are exposed to the entire voltage range. *Id.* at 4:46–53. In this manner, the overall switching is relatively fast while the voltage range of the entire up-shift circuit 100 is extended beyond the maximum permissible for any individual thin-gate of the up-shift circuit. *Id.* at 4:56–60, code (57).

D. Illustrative Claim

Of the challenged claims, claims 1 and 17 are independent. Claim 1 is illustrative of the challenged claims and is reproduced below.

> 1. A level shifter circuit, comprising:
>
> a first circuit, responsive to an input signal, that switches first and second nodes to opposite states within a first voltage range between first and second supply voltages;
>
> a protection layer which couples said first and second nodes to third and fourth nodes via first and second isolation paths, respectively, wherein said first and second isolation paths keep said first and second nodes within said first voltage range and keep said third and fourth nodes within a second voltage range; and
>
> a second circuit that switches said third and fourth nodes to opposite states within said second voltage range between third and fourth supply voltages in response to switching of said first and second nodes, said second circuit comprising:
>
> a first inverter having an input coupled to said fourth node, an output coupled to said third node and supply inputs coupled between said third and fourth supply voltages; and
>
> a second inverter having an input coupled to said third node, an output coupled to said fourth node and supply inputs coupled between said third and fourth supply voltages.

Ex. 1001, 16:56–17:11.

E. Applied References and Declarations

Petitioner relies upon the following references in its challenges to patentability.

Reference and Date	Designation	Exhibit No.
U.S. Patent No. 5,440,249 (issued Aug. 8, 1995)	Schucker	1002
U.S. Patent No. 5,969,542 (issued Oct. 19, 1999)	Maley	1003

Petitioner also relies on two declarations from Patrick Chapman, Ph.D. in support of its Petition and Reply. Ex. 1004 ("the Chapman Declaration"); Ex. 1013 ("the Chapman Reply Declaration"). Patent Owner relies on the Declaration of Engin Ipek, Ph.D. (Ex. 2002, "the Ipek Declaration") in support of its Patent Owner Response.

F. Instituted Grounds of Unpatentability

Petitioner challenges the patentability of claims 1, 2, 4, and 17 of the '588 patent on the following grounds (Pet. 3, 25–74):

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1, 4, 17	102[1]	Schucker
2	103(a)	Schucker and Maley
2	103(a)	Schucker and the knowledge of a person of ordinary skill in the art

[1] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA"), amended 35 U.S.C. §§ 102 and 103. Because the '588 patent has an effective filing date prior to the effective date of the applicable AIA amendments, we refer to the pre-AIA versions of §§ 102 and 103.

III. ANALYSIS

A. Level of Ordinary Skill in the Art

Petitioner proposes that a person of ordinary skill in the art at the time of the invention would have had at least an M.S. degree in electrical engineering and three years of experience with CMOS technology. Pet. 24. Neither Patent Owner, in its Response, nor Dr. Ipek, in his declaration, proposes a level of ordinary skill in the art. Dr. Ipek, however, states "[f]or the purposes of the subject IPR proceedings, I have been asked to employ [Petitioner's proposed] standard of a person of ordinary skill, but I do not offer the opinion that it is the correct standard." Ex. 2002 ¶ 19.

Based on the complete record, we find Petitioner's proposal consistent with the level of ordinary skill in the art reflected by the prior art of record, *see Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995); *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978), and adopt Petitioner's unopposed position as to the level of ordinary skill in the art.

B. Claim Construction

In an *inter partes* review based on a petition filed prior to November 13, 2018, claim terms in an unexpired patent are construed according to their broadest reasonable interpretation in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b) (2017);[2] *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016).

[2] A recent amendment to this rule does not apply here because the Petition was filed before November 13, 2018. *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before

Under the broadest reasonable interpretation (BRI) standard, and absent any special definitions, claim terms generally are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art, in view of the specification. *In re Translogic Tech. Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

Petitioner does not propose express constructions for any claim terms in the Petition and asserts that the challenged claims are unpatentable under the plain meaning interpretation of the claims. Pet. 24. In its Response, Patent Owner proposes constructions for three terms—namely, "couples" recited in claim 1, "coupling" recited in claim 17, and "thin-gate oxide devices" recited in claim 2. PO Resp. 19–34.

Patent Owner asserts that the claim term "couples" recited in claim 1 should be construed to require the recited "protection layer" electrically connect the nodes of the lower circuit to the nodes of the upper circuit via both of the isolation paths, "in a push/pull function." *Id.* at 20. Patent Owner contends that to "couple," as recited in the claim, the "protection layer" must (1) conduct electricity, (2) in both isolation paths, (3) in opposite directions, and (4) at the same time. *Id.* at 3, 13, 20–25, 35–36, 42, 48; Sur-reply 5–7. Patent Owner makes similar claim construction arguments regarding the claim term "coupling" recited in claim 17. PO Resp. 27–29.

Patent Owner argues that because Schucker's protection layer "can only pull" in one isolation path while the other isolation path is "non-conductive," Schucker does not anticipate the claims. *Id.* at 20.

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the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (amending 37 C.F.R. § 42.100(b) effective Nov. 13, 2018) (now codified at 37 C.F.R. pt. 42 (2019)).

Although Patent Owner's arguments raise an issue of claim construction, Patent Owner's arguments are closely related to and interspersed with Patent Owner's arguments that Schucker does not anticipate claims 1 and 17. Thus, for efficiency and completeness, we address this issue in the context of the patentability discussion below.

Turning next to the claim term "thin-gate oxide devices" recited in claim 2, in its Response, Patent Owner asserts that the claim term "thin-gate oxide devices" should be interpreted to exclude "Schucker's 3.3V-range devices" because the '588 patent defines such devices as "thick-gate" devices. PO Resp. 29. Again, although Patent Owner's argument raises an issue of claim construction, Patent Owner's argument is closely related to and interspersed with Patent Owner's arguments that Schucker in combination with Maley does not render claim 2 unpatentable. Thus, for efficiency and completeness, we also address this issue in the context of the patentability discussion below.

No other claim terms need to be construed expressly for this Final Written Decision. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (holding that only terms that are in controversy need to be construed, and "only to the extent necessary to resolve the controversy"); *see also Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (applying *Vivid Techs.* in the context of an *inter partes* review).

C. Anticipation by Schucker

Petitioner contends that claims 1, 4, and 17 are unpatentable as anticipated by Schucker. Pet. 25–60; Reply 2–20. Petitioner provides

detailed explanations and specific citations to Schucker indicating where in the reference the claimed features are disclosed. Pet. 25–60. In addition, Petitioner relies upon the Chapman Declaration (Ex. 1004) and the Chapman Reply Declaration (Ex. 1013) to support its positions. Pet. 25–60; Reply 2–20. Patent Owner's opposition is directed to one specific claimed feature only—namely, Patent Owner asserts that Schucker does not disclose the feature of coupling by isolation paths recited in independent claims 1 and 17. PO Resp. 19–29, 35–54; Sur-reply 5–24. Patent Owner relies on the Ipek Declaration (Ex. 2002) to support its positions. *Id.* The parties also cite the deposition testimony of Dr. Chapman (Exs. 2005, 2009) and the deposition testimony of Dr. Ipek (Ex. 1012) in support of the parties' respective arguments. *See* PO Resp.; Reply; Sur-reply. Upon review of all of the parties' papers and after considering the evidence of record presented during this proceeding, for the reasons explained below, we are persuaded that Petitioner has demonstrated, by a preponderance of the evidence, that claims 1, 4, and 17 are unpatentable under 35 U.S.C. § 102 as anticipated by Schucker.

1. Relevant Principles of Law

A claim is unpatentable under 35 U.S.C. § 102 only if a single prior art reference expressly or inherently describes each and every limitation set forth in the claim. *See Perricone v. Medicis Pharm. Corp.*, 432 F.3d 1368, 1375 (Fed. Cir. 2005); *Verdegaal Bros., Inc. v. Union Oil Co.*, 814 F.2d 628, 631 (Fed. Cir. 1987). Further, a reference cannot anticipate "unless [it] discloses within the four corners of the document not only all of the limitations claimed[,] but also all of the limitations arranged or combined in the same way as recited in the claim." *Net MoneyIN, Inc. v. VeriSign, Inc.*,

545 F.3d 1359, 1371 (Fed. Cir. 2008). Although the elements must be arranged in the same way as in the claim, "the reference need not satisfy an *ipsissimis verbis* test," i.e., identity of terminology is not required. *In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009); *In re Bond*, 910 F.2d 831, 832 (Fed. Cir. 1990). Moreover, the prior art reference is read from the perspective of one with ordinary skill in the art. *In re Graves*, 69 F.3d 1147, 1152 (Fed. Cir. 1995) ("A reference anticipates a claim if it discloses the claimed invention such that a skilled artisan could take its teachings in combination with his own knowledge of the particular art and be in possession of the invention." (citation and quotation marks omitted)); *In re Preda*, 401 F.2d 825, 826 (CCPA 1968) ("[I]n considering the disclosure of a reference, it is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw therefrom."). We analyze this asserted ground based on anticipation with the principles identified above in mind.

2. *Overview of Schucker (Ex. 1002)*

Schucker describes a voltage level translator circuit that converts an input signal ranging between first and second operating potentials to an output signal ranging between second and third operating potentials. Ex. 1002, code (57). As background, Schucker describes that voltage level translator circuits are commonly used to convert a data signal from one voltage level to another voltage level that represents the same logic state. *Id.* at 1:9–11. According to Schucker, such voltage level shifting is necessary when interfacing sub-micron MOS devices to larger or higher-micron MOS devices, which operate at higher voltage levels. *Id.* at 1:12–20.

Schucker describes that a problem occurs in such level shifting MOS transistors when they are subject to the full higher voltage across their gate oxide layer, because the submicron MOS gate oxide devices cannot handle the higher voltage stresses. *Id.* at 1:25–29. According to Schucker, a need therefore exists to translate voltage levels in submicron MOS devices without overstressing the gate oxide layers. *Id.* at 1:30–32.

Figure 1 of Schucker is reproduced below.

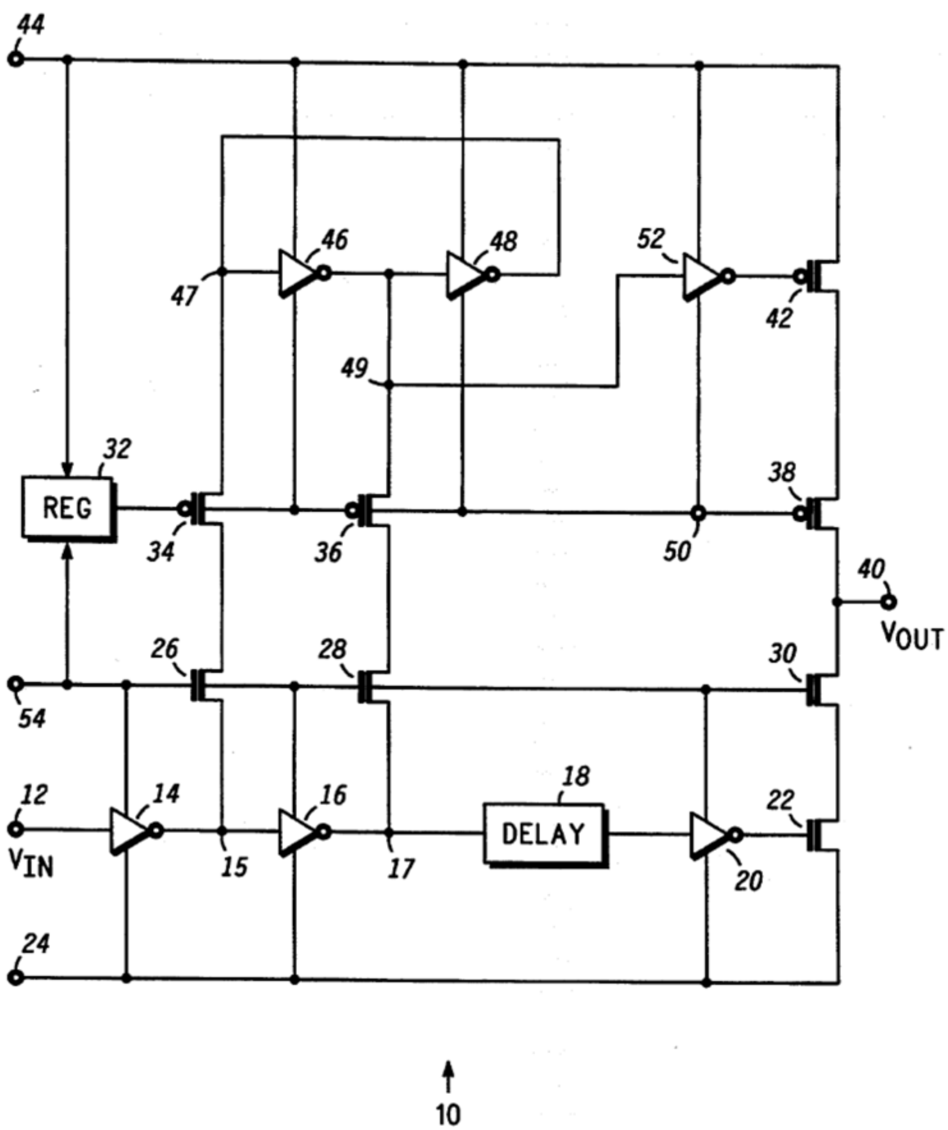

FIG. 1

Figure 1 is a schematic and block diagram illustrating a voltage level translator circuit. *Id.* at 1:35–36.

Referencing Figure 1, Schucker describes that voltage level translator circuit 10 can be used to transition from 0.5 submicron MOS technology, where a logic one (or high) is 3.3 volts, to higher micron MOS technology, where a logic one is 5.0 volts. *Id.* at 1:49–53. Starting with the input signal to voltage level translator circuit 10, Schucker describes that an input signal V_{IN} operating between 0.0 volts (for logic zero) and 3.3 volts (for logic one) is applied to the input of inverter 14. *Id.* at 1:54–56. The output of inverter 14 is coupled to node 15 and to the input to inverter 16. *Id.* at 1:56–57. The output of inverter 16 is coupled to node 17. *Id.* at 1:57–59.

As depicted in Figure 1 and described in the accompanying text, the source of N-channel transistor 26 is coupled to node 15, and the source of N-channel transistor 28 is coupled to node 17. *Id.* at 1:65–2:2. N-channel transistors 26 and 28 each have a gate commonly coupled to terminal 54 to receive a power supply potential of 3.3 volts. *Id.* at 1:65–67. A ground potential (i.e., 0.0 volts) is provided at terminal 24. *Id.* at 1:64–65.

As shown in Figure 1, P-channel transistors 34 and 36 each receive an operating potential at their gates from the output of regulator circuit 32. *Id.* at 2:9–11. According to Schucker, the output of regulator circuit 32 is at 1.7 volts, which is 3.3 volts lower than 5 volts, the power supply voltage at terminal 44. *Id.* at 2:9–16. Referencing Figure 1, Schucker describes that the drain of P-channel transistor 34 is coupled to the drain of N-channel transistor 26, and the drain of P-channel transistor 36 is coupled to the drain of N-channel transistor 28. *Id.* at 2:32–34.

According to Schucker, in this arrangement of transistors, inverters, and supply voltages, the maximum voltages for all transistors in circuit 10 (i.e., the voltages across gate to source, gate to drain, and drain to source) is limited to 3.3 volts. *Id.* at 2:17–18. That is, no transistor junction or gate oxide layer in the circuit is exposed to more than 3.3 volts. *Id.* at 2:19–22. Schucker describes that the voltage level translation process of circuit 10, therefore, does not cause any of the 0.5 submicron MOS transistors to exceed their maximum voltage rating of 3.3 volts. *Id.* at 2:26–29.

Regarding the operation of voltage level translator circuit 10, Schucker describes that when the input signal V_{IN} is at logic zero (i.e., 0.0 volts), node 15 goes to logic one (i.e., 3.3 volts) and node 17 goes to logic zero (i.e., 0.0 volts). *Id.* at 2:56–59. Schucker describes that node 15 being set to logic one turns off transistors 26 and 34, which in turn sets node 47 to logic one. *Id.* at 2:60–65, 3:6–7. On the other hand, node 17 being set to logic zero turns transistors 28 and 36 on, causing them to pull node 49 to logic zero. *Id.* at 2:66–3:3, 3:5–6.

According to Schucker, node 49 being at logic zero sets the output of inverter 52 to logic one, which turns off transistor 42 and makes transistor 38 non-conductive. *Id.* at 3:14–17. Schucker describes that while the logic zero input signal V_{IN} turns off transistors 38 and 42, the logic zero at node 17 propagates through delay circuit 18 and causes the output of inverter 20 to go to logic one approximately two nanoseconds later. *Id.* at 3:18–20, 25–28. This turns on transistor 22, which allows conduction from output terminal 40, through transistors 30 and 22, to terminal 24. *Id.* at 3:29–32. Schucker describes that the output signal V_{OUT} at terminal 40,

therefore, is pulled low to logic zero, i.e., the ground voltage 0.0 volts at terminal 24. *Id.* at 3:31–32.

When the input signal V_{IN} switches to logic one (i.e., 3.3 volts), Schucker describes that node 15 goes to logic zero (i.e., 0.0 volts) and node 17 goes to logic one (3.3 volts). *Id.* at 3:33–35. This turns off transistors 28 and 36, and turns transistor 26 on and makes transistor 34 conduct. *Id.* at 3:35–43. According to Schucker, as the result, node 47 goes to logic zero and node 49 goes to logic one. *Id.* at 3:8–9, 45–47. The logic one at node 49 causes the output of inverter 52 to go to logic zero, which turns on transistor 42 and makes transistor 38 conduct. *Id.* at 3:47–48. Consequently, the conduction path from terminal 44 and output 40 is completed, pulling the output signal V_{OUT} at terminal 40 high to logic one at the operating potential of terminal 44, i.e., 5 volts. *Id.* at 3:48–51.

Thus, voltage level translator circuit 10 converts the input signal V_{IN} operating between 0.0 volts (for logic zero) and 3.3 volts (for logic one) to the output signal V_{OUT} between 0.0 volts (for logic zero) and 5 volts (for logic one) without causing any of the 0.5 submicron MOS transistors of the circuit to exceed their maximum allowable voltage of 3.3 volts. *Id.* at 1:54–56, 2:17–29, 2:56–3:51.

3. *Discussion — Claim 1*

Petitioner contends that Schucker's "voltage level translator circuit," as illustrated in Schucker's Figure 1 and described in the related text, discloses every limitation of claim 1. Pet. 25–46. As noted above, Patent Owner's counter arguments are directed to one particular claim limitation only—that is, Patent Owner asserts that Schucker does not disclose "a protection layer which couples said first and second nodes to third and

fourth nodes via first and second isolation paths, respectively," as recited in claim 1, under Patent Owner's proposed construction of the term "couples." *See, e.g.*, PO Resp. 19–27, 35–36. In what follows, we first discuss Petitioner's contentions on how Schucker discloses each limitation recited in claim 1. We then address Patent Owner's arguments, including its claim construction arguments, and Petitioner's responses.

a. Petitioner's Contentions

(i) Preamble[3]

The preamble of claim 1 recites a "level shifter circuit." Petitioner contends that "[t]o the extent the preamble is limiting," Schucker's "voltage level translator circuit" discloses a level shifter circuit because it "converts an input signal referenced between first and second operating potentials to an output signal referenced between second and third operating potentials." Pet. 25 (citing Ex. 1002, code (57)). Petitioner asserts that, in Schucker, the input signal is "*level shifted* through cascoded transistors and latched by series inverters to drive upper cascoded transistors in the output stage." *Id.* (citing Ex. 1002, code (57), Fig. 1; Ex. 1004 ¶ 58).

Patent Owner does not specifically dispute Schucker discloses the preamble of claim 1. *See* PO Resp. 35–52.

[3] We take no position on whether the preamble of claim 1 is limiting as the parties have not raised that issue before us.

Based on the complete record and for the reasons explained by Petitioner, we are persuaded that Petitioner has demonstrated sufficiently that Schucker discloses the preamble of claim 1.[4]

(ii) Claim element 1[a]

Petitioner designates as claim element 1[a] the limitation that recites "a first circuit, responsive to an input signal, that switches first and second nodes to opposite states within a first voltage range between first and second supply voltages." Pet. 26. Referencing an annotated version of Figure 1 of Schucker, Petitioner contends that Schucker discloses all recitations of claim element 1[a]. *Id.* at 26–28 (citing Ex. 1002, 1:3–5, 1:55–2:9, 2:58–60, 3:33–35, 6:3–5, Fig. 1; Ex. 1004 ¶¶ 59–61).

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[4] We also find that Patent Owner has waived any argument directed to the preamble of claim 1. *See* Paper 9 (Scheduling Order), 5 ("Patent Owner is cautioned that any arguments for patentability not raised in the response may be deemed waived" (emphasis omitted)).

Figure 1 of Schucker, as annotated by Petitioner, is reproduced below.

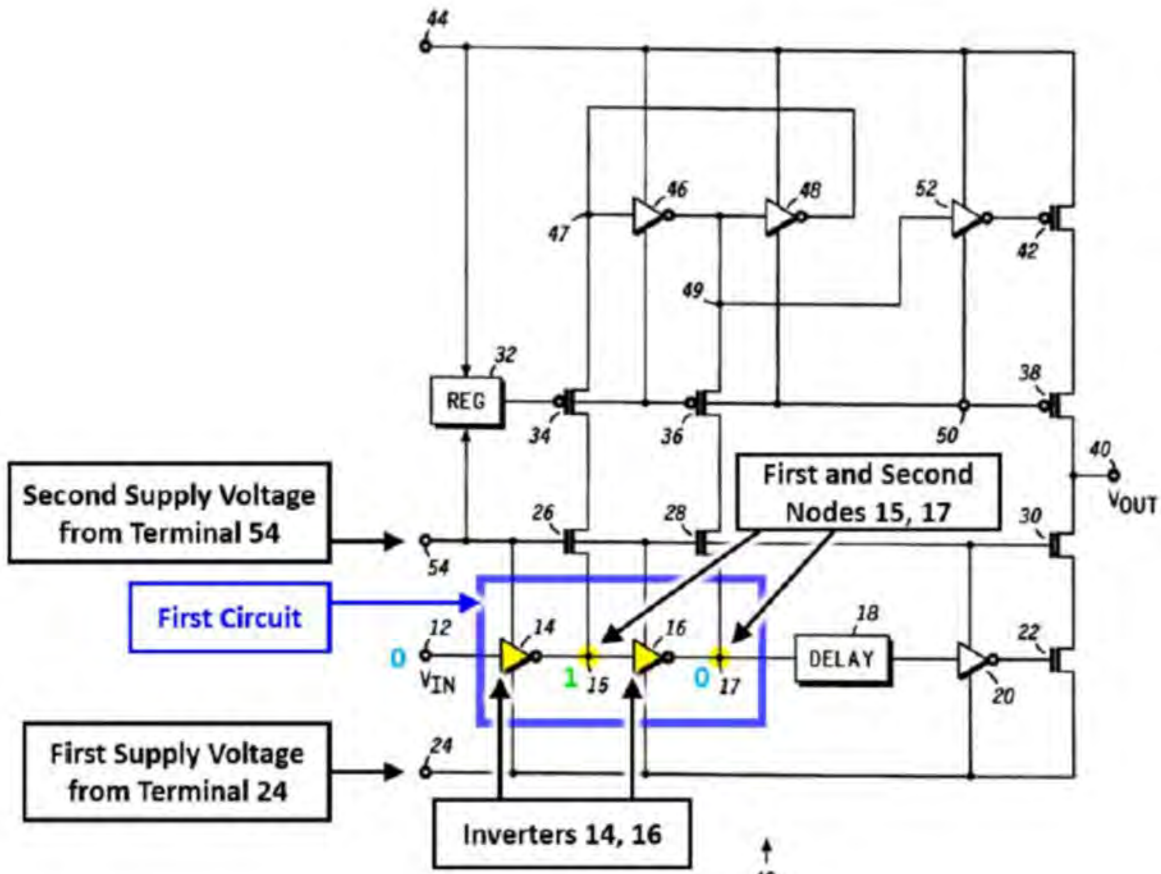

FIG. 1

Id. at 27. Annotated Figure 1 above shows Petitioner's identification of the recitations of claim element 1[a] allegedly present in Schucker.

Referencing Figure 1, Petitioner asserts that the circuit Petitioner identified in Figure 1 of Schucker, including inverters 14 and 16 and nodes 15 and 17, discloses the "first circuit" recited in claim 1. *Id.* at 26–27 (citing Ex. 1002, 1:55–2:5, 2:58–60, 3:33–35, Fig. 1; Ex. 1004 ¶ 59). Petitioner also maps nodes 15 and 17 of Schucker to the recited "first node" and "second node," respectively. *Id.* at 27. Petitioner argues that these elements of Schucker identified by Petitioner comprise a circuit because they provide a path for current flow from a supply voltage of 3.3 volts at

terminal 54 (the recited "second supply voltage") to a ground voltage of 0.0 volts at terminal 24 (the recited "first supply voltage"). *Id.* at 26 (citing Ex. 1002, 1:55–2:5), 27 (citing Ex. 1002, 1:64–66, 2:6–9, Fig. 1).

Petitioner further contends that Schucker's circuit identified by Petitioner as the claimed "first circuit" is "responsive to an input signal" and "switches first and second nodes to opposite states within a first voltage range between first and second supply voltages," as recited in claim 1, because Schucker describes that when the input signal V_{IN} (the recited "input signal") is at logic zero of 0.0 volts (i.e., the recited "first supply voltage"), node 15 goes to logic one (3.3 volts) and node 17 goes to logic zero (0.0 volts), and that when the input signal V_{IN} is at logic one of 3.3 volts (i.e., the recited "second supply voltage"), node 15 goes to logic zero and node 17 goes to logic one (i.e., "switch[ing] to opposite states," as recited in the claim). *Id.* at 26–27 (citing Ex. 1002, 1:64–66, 2:6–9, 2:58–60, 3:33–35, Fig. 1; Ex. 1004 ¶ 59). Petitioner argues that Schucker's voltage range of 0.0 volts (provided at terminal 24) to 3.3 volts (provided at terminal 54) discloses "a first voltage range between first and second supply voltages," as recited in claim 1. *Id.* at 27–28 (citing Ex. 1002, 1:3–5, 1:55–57, 1:64–68, 2:3–9, 6:3–5, Fig. 1; Ex. 1004 ¶ 60).

Patent Owner does not contest Petitioner's argument that Schucker discloses the recitations of claim element 1[a]. *See* PO Resp. 35–52.

Based on the complete record and for the reasons explained by Petitioner, we are persuaded that Petitioner has demonstrated sufficiently that Schucker discloses "a first circuit, responsive to an input signal, that

switches first and second nodes to opposite states within a first voltage range between first and second supply voltages," as recited in claim 1.[5]

(iii) Claim element 1[b]

Petitioner designates as claim element 1[b] the limitation that recites "a protection layer which couples said first and second nodes to third and fourth nodes via first and second isolation paths, respectively." Pet. 28. Referencing another annotated version of Figure 1 of Schucker, Petitioner contends that Schucker discloses all recitations of claim element 1[b]. *Id.* at 28–31 (citing Ex. 1002, 1:66–2:29, 2:32–42, 3:3–6, 4:35–41, 5:49–60, Fig. 1; Ex. 1004 ¶¶ 62–66).

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[5] We also find that Patent Owner has waived any argument directed to this claim limitation. *See* Paper 9, 5.

Figure 1 of Schucker, as annotated by Petitioner, is reproduced below.

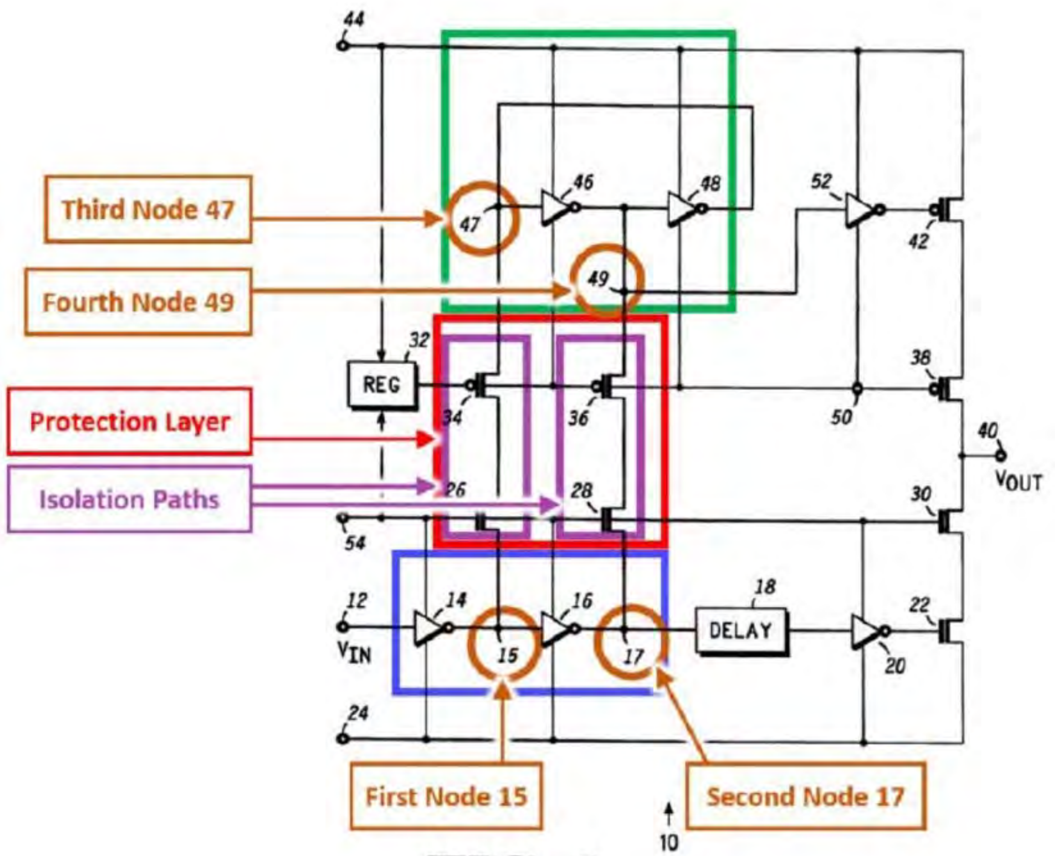

FIG. 1

Id. at 29. Figure 1 above, as annotated by Petitioner, shows Petitioner's identification of the recitations of claim element 1[b] allegedly present in Schucker, including "a protection layer," "first and second nodes," "third and fourth nodes," and "first and second isolation paths." *Id.*

Referencing Figure 1, Petitioner asserts that the circuit Petitioner identified in Schucker's Figure 1, including transistors 26, 28, 34, and 36, discloses "a protection layer," as recited in claim 1. *Id.* at 28–29 (citing Ex. 1002, 5:49–60, Fig. 1). Petitioner also maps nodes 47 and 49 depicted in Figure 1 of Schucker to the recited "third and fourth nodes," respectively. *Id.* (citing Ex. 1002, 1:66–2:29, 2:32–42, 3:3–6, 5:49–60, Fig. 1; Ex. 1004

¶ 62). Petitioner contends that Schucker's cascoded transistors 26 and 34 [6] disclose the recited "first isolation path" that couples node 15 (the recited "first node") to node 47 (the recited "third node") and that the cascoded transistors 28 and 36 disclose the recited "second isolation path" that couples node 17 (the recited "second node") to node 49 (the recited "fourth node"). *Id.* (citing Ex. 1002, 1:66–2:29, 2:32–42, 3:3–6, 5:49–60, Fig. 1; Ex. 1004 ¶ 62).

Petitioner asserts that Schucker's circuit (including transistors 26, 28, 34, and 36) identified by Petitioner as the claimed "protection layer" provides "electrical stress protection." *Id.* at 28 (citing Ex. 1002, 5:49–60). Petitioner also contends that, for the reasons discussed in its analysis of claim element 1[c], Schucker's configuration of transistors 26, 28, 34 and 36 (a) protects Schucker's first circuit (discussed above) from being subject to a high voltage used for Schucker's second circuit (also discussed above) and (b) protects transistors in Schucker's second circuit from being subject to the

[6] The word "cascoded" appears to be a term of art in the field of electronic circuits. Schucker uses the phrase "cascoded" transistors to refer to "stacked" transistors, such as transistors 26 and 34 or transistors 28 and 36 depicted in Figure 1 of Schucker. *See* Ex. 1002, code (57) ("Additional *cascoded* transistors may be *stacked* to extend the range of voltage translation." (emphases added)), 1:66–2:23 (describing the configuration of stacked transistors 26, 34 and stacked transistors 28, 36 depicted in Figure 1 as "cascoded arrangement"), Fig. 1. This usage appears to be consistent with the definition or description of the term "cascode" found in general electronics literature. *See, e.g.*, Ex. 3001 ("The Illustrated Dictionary of Electronics," 8th ed., 2001), 103 (defining "cascode" as a "high-gain, low-noise, high-input impedance amplifier circuit, consisting of a grounded-emitter or grounded-source input stage coupled directly to a grounded-base or grounded-gate output stage" and describing two stacked FETs as "cascode (field-effect transistor arrangement).")

ground voltage of 0 volts used for Schucker's first circuit. *Id.* at 29 (citing *id.* § IX.A.1.d.; Ex. 1004 ¶ 63); *see also id.* at 31–40 (describing in detail the operation of transistors 26, 28, 34, and 36 to keep inverters 14 and 16 and nodes 15 and 17 within the voltage range of 0 volts to 3.3 volts and to keep inverters 46 and 48 and nodes 47 and 49 within the voltage range of 1.7 volts to 5 volts (citing Ex. 1002, 1:55–57, 1:64–66, 2:6–36, 2:58–3:1, 3:3–12, 3:33–35, 3:38–67, 4:9–12, 4:40–42, Figs. 1, 2; Ex. 1004 ¶¶ 67–76)).

Petitioner further asserts that Schucker's configuration of transistors 26, 28, 34, and 36 discloses the same "protection layer" as disclosed in the '588 patent because Schucker's transistors 26, 28, 34, and 36, arranged as shown in Figure 1, operate the same way as the "protection layer" described in the '588 patent. *Id.* at 29–31 (citing Ex. 1002, 1:66–68, 2:9–11; Ex. 1001, 4:35–41; Ex. 1004 ¶¶ 63–66). Petitioner contends that the '588 patent discloses

> [t]he transistors 113, 115, 117 and 119 of the protection layer 104 are also thin gate devices. The *transistors 113 and 115 receive VDDL at their gates* thereby preventing the voltage of the lower circuit 102 from exceeding VDDL. The *transistors 117 and 119 receive GNDH at their gates* thereby preventing the voltage of the upper circuit 106 from falling below GNDH.

Id. at 29–30 (citing Ex. 1001, 4:35–41; Ex. 1004 ¶ 64). Petitioner asserts that Schucker similarly discloses "the transistors 26, 28 receive the second supply voltage of 3.3 volts at their gates, and the transistors 34, 36 receive the third supply voltage of 1.7 volts at their gates." *Id.* at 30 (citing Ex. 1002, 1:66–68, 2:9–11; Ex. 1004 ¶ 65). Petitioner illustrates the alleged similarities with a side-by-side comparison (not reproduced herein) of Figure 1 of the '588 patent and Figure 1 of Schucker, with annotations showing Petitioner's mapping of the elements of Schucker and the matching

elements of the ’588 patent allegedly corresponding to the same recitations of claim 1. *Id.* (comparing Ex. 1001, Fig. 1, with Ex. 1002, Fig. 1). Petitioner contends that Schucker therefore discloses “a protection layer which couples said first and second nodes to third and fourth nodes via first and second isolation paths, respectively,” as recited in claim 1. *Id.* at 31 (citing Ex. 1004 ¶ 66).

Patent Owner appears not to dispute Petitioner’s contention that Schucker discloses the “a protection layer,” “first and second nodes,” “third and fourth nodes,” and “first and second isolation paths,” arranged as recited in the claim. *See, e.g.*, PO Resp. 15 (“There is considerable *similarity in topology* between Schucker’s Figure 1 circuit and the Patent’s Figure 1 circuit.” (emphasis added)). Instead, Patent Owner argues that “Schucker’s topologically similar circuit” *operates differently* than the circuit described and claimed by the ’588 patent. *See id.* at 37 (“The Petition . . . fails to show that *Schucker’s topologically similar circuit* operates in the manner described in and claimed by the Patent. In fact, Schucker explicitly teaches that it *does not work in the same manner*.” (emphases added)), 49 (“[A]lthough *Schucker and the Patent have similar topology*, they can and do *operate in a different manner*.” (emphases added)). We discuss Patent Owner’s arguments on the purported operational differences and Petitioner’s responses to those arguments in Section III.C.3.b. below.

Based on the complete record and the foregoing discussion of the evidence and arguments presented by Petitioner and Patent Owner, we are persuaded that Petitioner has demonstrated sufficiently that Schucker discloses “a protection layer,” “first and second nodes,” “third and fourth

nodes," and "first and second isolation paths," arranged as recited in the claim.

(iv) Claim element 1[c]

Petitioner designates as claim element 1[c] the wherein clause that modifies claim element 1[b], i.e., the limitation that recites "wherein said first and second isolation paths keep said first and second nodes within said first voltage range and keep said third and fourth nodes within a second voltage range." Pet. 31. Petitioner contends that Schucker discloses the recitations of claim element 1[c]. *Id.* at 31–40 (citing Ex. 1002, 1:55–57, 1:64–66, 2:6–36, 2:58–3:1, 3:3–12, 3:33–35, 3:38–67, 4:9–12, 4:40–42, Figs. 1, 2; Ex. 1004 ¶¶ 67–76).

As discussed above regarding Petitioner's contentions on claim element 1[a], Petitioner asserts that Schucker's voltage range between 0.0 volts provided at terminal 24 (the recited "first supply voltage") and 3.3 volts provided at terminal 54 (the recited "second supply voltage") discloses "a first voltage range between first and second supply voltages," as recited in claim 1. *Id.* at 27–28 (citing Ex. 1002, 1:3–5, 1:55–57, 1:64–68, 2:3–9, 6:3–5, Fig. 1; Ex. 1004 ¶ 60), 31 (citing Ex. 1002, 1:64–66, 2:6–9, Fig. 1; Ex. 1004 ¶ 67). Petitioner also contends that Schucker's voltage range of 1.7 volts (provided by voltage regulator circuit 32) to 5 volts (provided at terminal 44) discloses "a second voltage range" recited in claim 1. *Id.* at 32–33 (citing Ex. 1002, 2:6–17, Fig. 1; Ex. 1004 ¶ 68).

In addition, as discussed above in the context of claim element 1[b], Petitioner asserts that Schucker's cascoded N-channel transistor 26 and P-channel transistor 34 disclose the recited "first isolation path" that couples node 15 (the recited "first node") to node 47 (the recited "third node") and

that Schucker's cascoded N-channel transistor 28 and P-channel transistor 36 disclose the recited "second isolation path" that couples node 17 (the recited "second node") to node 49 (the recited "fourth node"). *Id.* at 28–29 (citing Ex. 1002, 1:66–2:29, 2:32–42, 3:3–6, 5:49–60, Fig. 1; Ex. 1004 ¶ 62).

Petitioner asserts that Schucker's circuit elements Petitioner identifies as the recited "first and second isolation paths" (i.e., the cascoded transistors 26, 34 and 28, 36) perform the function recited in element 1[c] (i.e., to "keep" the recited "first and second nodes" and "third and fourth nodes" within the "first voltage range" and the "second voltage range," respectively), using the same arrangement of N-channel transistors and P-channel transistors described in the Specification of the '588 patent. *Id.* at 31–40 (citing Ex. 1002, 1:55–57, 1:64–66, 2:6–36, 2:58–3:1, 3:3–12, 3:33–35, 3:38–67, 4:9–12, 4:40–42, Figs. 1, 2; Ex. 1001, Fig. 1; Ex. 1004 ¶¶ 67–76). Petitioner contends, therefore, that Schucker's isolation paths are identical to the isolation paths disclosed in the '588 patent. *Id.* at 39 (citing Ex. 1004 ¶ 75).

Turning first to Petitioner's contentions on the identity or similarity of arrangement between the "first and second isolation paths" allegedly present in Schucker and the "first and second isolation paths" described in the '588 patent, Petitioner provides annotated versions of Schucker's Figure 1 (not reproduced herein), illustrating the arrangement of Schucker's N-channel transistors 26 and 28 and P-channel transistors 34 and 36, with the drains of the N-channel transistors tied to the drains of the respectively cascoded P-channel transistors and the sources of the N-channel transistors and the P-channel transistors connected to nodes 15 and 17 and nodes 47 and 49,

respectively. *Id.* at 34, 37. Petitioner also provides a side-by-side comparison (not reproduced herein) of Figure 1 of Schucker and Figure 1 of the ’588 patent, with annotations showing Petitioner’s mapping of the elements of Schucker to the allegedly matching elements of the ’588 patent (*id.* at 39), and asserts that Schucker’s isolation paths are identical to the isolation paths disclosed in the ’588 patent (*id.* (citing Ex. 1004 ¶ 75)).

As discussed above, Patent Owner acknowledges that circuit elements in Schucker’s Figure 1 Petitioner identifies as the recited “first and second isolation paths” are “topologically similar” to the allegedly matching circuit elements in Figure 1 of the ’588 patent. *See* PO Resp. 37; *see also id.* at 15 (“There is considerable *similarity in topology* between Schucker’s Figure 1 circuit and the Patent’s Figure 1 circuit.” (emphasis added)), 49 (“[A]lthough *Schucker and the Patent have similar topology*, they can and do operate in a different manner.” (emphasis added)).

Upon review of the complete record and considering the arguments and evidence presented by Petitioner and Patent Owner, we agree with Petitioner that the arrangement of N-channel transistors 26 and 28, P-channel transistors 34 and 36, nodes 15 and 17, and nodes 47 and 49 of Schucker described in Schucker’s Figure 1 discloses the arrangement of N-channel transistors 113 and 115, P-channel transistors 117 and 119, nodes 105 and 111, and nodes 121 and 123 of the ’588 patent, as described in Figure 1 of the ’588 patent. *Compare* Ex. 1001, Fig. 1, 3:4–13 (The ’588 patent describing the arrangement of N-channel transistors 113 and 115 and P-channel transistors 117 and 119, with the drains of the N-channel transistors coupled to the drains of the corresponding P-channel transistors, the sources of the N-channel transistors coupled to nodes 105 and 111, and

the sources of the P-channel transistors coupled to nodes 121 and 123.), 5:16–19 ("The transistors 113 and 117 form a first isolation path between nodes 105 and 121 and the transistors 115 and 119 form a second isolation path between nodes 111 and 123."), *with* Ex. 1002, 1:64–2:5, 2:33–35, Fig. 1 (Schucker describing the arrangement of N-channel transistors 26 and 28 and P-channel transistors 34 and 36, with the drains of the N-channel transistors coupled to the drains of the respectively cascoded P-channel transistors, the sources of the N-channel transistors coupled to nodes 15 and 17, and the sources of the P-channel transistors coupled to nodes 47 and 49). In other words, we agree with Petitioner that the arrangement of Schucker's circuit elements Petitioner identifies as the recited "first and second isolation paths" discloses the "first and second isolation paths" described in the '588 patent.

Turning to the functional or operational aspects of Schucker's circuit elements Petitioner identifies as the recited "first and second isolation paths," Petitioner contends that Schucker's cascoded transistors 26 and 34 and cascoded transistors 28 and 36 (the recited "first and second isolation paths") keep nodes 15 and 27 (the recited "first and second nodes") within the voltage range of the ground voltage of 0.0 volts provided at terminal 24 (the recited "first supply voltage") and 3.3 volts provided at terminal 54 (the recited "second supply voltage"), i.e., within the recited "first voltage range," and also keep nodes 47 and 49 (the recited "third and fourth nodes") within the voltage range of 1.7 volts provided by voltage regulator circuit 32 and 5 volts provided at terminal 44, i.e., within the recited "second voltage range." Pet. 33–34 (citing Ex. 1002, 1:66–68, 2:9–29; Ex. 1004 ¶ 70). Petitioner provides detailed explanations and specific citations to Schucker,

describing in detail the operation of transistors 26, 28, 34, and 36 based on their cascoded arrangement to keep nodes 15 and 17 within the voltage range of 0.0 volts to 3.3 volts and to keep and nodes 47 and 49 within the voltage range of 1.7 volts to 5 volts. *Id.* at 31–40 (citing Ex. 1002, 1:55–57, 1:64–66, 2:6–36, 2:58–3:1, 3:3–12, 3:33–35, 3:38–67, 4:9–12, 4:40–42, Figs. 1, 2; Ex. 1004 ¶¶ 67–76).

In particular, Petitioner explains, citing the testimony of Dr. Chapman, the "protection" function (to "keep" the nodes within the first and second voltage ranges) provided by Schucker's isolation paths results from the operation of the cascoded transistors forming the isolation paths in the arrangement discussed above, where certain transistors in the isolation paths are turned on or off due to the cascode arrangement of the drains and sources of the transistors, as well as certain voltage conditions produced when the input signal V_{IN} switches between 0.0 volts and 3.3 volts. *Id.* at 33–40 (citing Ex. 1002, Fig. 1, 1:55–57, 1:66–68, 2:9–29, 2:58–3:12, 3:1–3, 3:5–6, 3:10–12, 3:33–35, 3:38–47; Ex. 1004 ¶¶ 70–76). Petitioner also explains, citing the testimony of Dr. Chapman, the arrangement of the '588 patent's transistors 113, 115, 117, and 119 forming the first and second isolation paths operates to keep nodes 105 and 111 within the voltage range of GNDL and VDDL and keep nodes 121 and 123 within the voltage range of GNDH and VDDH. *See id.* at 9–13 (citing Ex. 1001, Fig. 1, 2:58–60, 3:11–15, 3:40–67, 4:53–56, 4:1–26, 4:35–41, 5:23–25, 10:28–29; Ex. 1004 ¶¶ 37–41).

Patent Owner does not specifically dispute Schucker discloses the recitations of claim element 1[c]. *See* PO Resp. 35–52.

Upon review of the complete record and considering the arguments and evidence presented by Petitioner, we agree with Petitioner that the cascode arrangement of Schucker's transistors 26, 28, 34, and 36 (the recited "first and second isolation paths") operates to keep nodes 15 and 17 (the recited "first and second nodes") within the voltage range of 0.0 volts to 3.3 volts (the recited "first voltage range') and keep nodes 47 and 49 (the recited "third and fourth nodes") within the voltage range of 1.7 volts to 5 volts (the recited "second voltage range"), in the same way the arrangement of the '588 patent's transistors 113, 115, 117, and 119 forming the first and second isolation paths operates to keep nodes 105 and 111 within the voltage range of GNDL and VDDL and keep nodes 121 and 123 within the voltage range of GNDH and VDDH.

Based on the complete record and for the reasons explained by Petitioner, we are persuaded that Petitioner has demonstrated sufficiently that Schucker discloses "wherein said first and second isolation paths keep said first and second nodes within said first voltage range and keep said third and fourth nodes within a second voltage range," as recited in claim 1.[7]

(v) Claim element 1[d]

Petitioner designates as claim element 1[d] the limitation that recites "a second circuit that switches said third and fourth nodes to opposite states within said second voltage range between third and fourth supply voltages in response to switching of said first and second nodes." Pet. 40. Petitioner asserts that Schucker discloses all recitations of claim element 1[d]. *Id.* at

[7] We also find that Patent Owner has waived any argument directed to this claim limitation. *See* Paper 9, 5.

40–42 (citing 2:6–9, 2:29–31, 2:37–42, 2:58–66, 3:1–3, 3:6–8, 3:33–35, 3:42–47, Fig. 1; Ex. 1004 ¶¶ 77–81).

First, referencing Figure 1 of Schucker, Petitioner identifies Schucker's circuit including cross-coupled inverters 46 and 48 and nodes 47 and 49 as the claimed "second circuit" present in Schucker. *Id.* at 40–41 (citing Ex. 1002, 2:6–9, 2:29–31, Fig. 1; Ex. 1004 ¶¶ 77–78).

Next, Petitioner asserts that nodes 47 and 49 (the recited "third and fourth nodes") are switched to opposite states within the second voltage range between 1.7 volts (the recited "third supply voltage") provided by voltage regulator circuit 32 and 5.0 volts (the recited "fourth supply voltage") provided by terminal 44. *Id.* at 41 (citing Ex. 1002, 2:6–9; Ex. 1004 ¶ 78). Petitioner contends that node 47 (the recited "third node") is at 5 volts when node 15 (the recited "first node") is at logical one, and within a threshold voltage above 1.7 volts when node 15 is at logical zero. *Id.* at 41–42 (citing Ex. 1002, 2:58–66, 3:6–8, 3:33–35, 3:45–47). Petitioner further asserts that node 49 (the recited "fourth node") is within a threshold voltage above 1.7 volts when node 17 (the recited "second node") is at logical zero, and is at 5 volts when node 17 is at logical one. *Id.* at 42 (citing Ex. 1002, 2:58–60, 3:1–3, 3:33–35, 3:42–44; Ex. 1004 ¶ 79). Thus, Petitioner argues that the second circuit of Schucker switches nodes 47 and 49 (the recited "third and fourth nodes") to opposite states between 1.7 volts and 5 volts (the recited "second voltage range between third and fourth supply voltages") in response to the switching of nodes 15 and 17 (the recited "first and second nodes"). *Id.* (citing Ex. 1004 ¶ 80).

Patent Owner does not specifically dispute Schucker discloses the recitations of claim element 1[d]. *See* PO Resp. 35–52.

Based on the complete record and for the reasons explained by Petitioner, we are persuaded that Petitioner has demonstrated sufficiently that Schucker discloses "a second circuit that switches said third and fourth nodes to opposite states within said second voltage range between third and fourth supply voltages in response to switching of said first and second nodes," as recited in claim 1.[8]

(vi) Claim elements 1[e] and 1[f]

Petitioner designates as claim element 1[e] the limitation that recites "a first inverter having an input coupled to said fourth node, an output coupled to said third node and supply inputs coupled between said third and fourth supply voltages" and as claim element 1[f] the limitation reciting "a second inverter having an input coupled to said third node, an output coupled to said fourth node and supply inputs coupled between said third and fourth supply voltages." Pet. 42, 44. Petitioner contends that Schucker discloses all recitations of claim elements 1[e] and 1[f]. *Id.* at 42–46 (citing Ex. 1002, Fig. 1, 2:12–16, 2:29–40, 2:42–43, 2:51–53; Ex. 1004 ¶¶ 82–88).

Referencing Figure 1 of Schucker, Petitioner identifies Schucker's cross-coupled inverters 48 and 46 as the recited "first inverter" and "second inverter," respectively, present in Schucker. *Id.* at 42–43 (citing Ex. 1002, 2:38–39, Fig. 1), 44–45 (citing Ex. 1002, 2:29–31, Fig. 1).

Petitioner asserts that, as shown in Figure 1, inverter 48 of Schucker has an input coupled to node 49 (the recited "fourth node") and an output coupled to node 47 (the recited "third node"). *Id.* at 42–43 (citing Ex. 1002,

[8] We also find that Patent Owner has waived any argument directed to this claim limitation. *See* Paper 9, 5.

2:38–39, 2:42–43, Fig. 1; Ex. 1004 ¶ 82). Petitioner contends that Figure 1 also shows that inverter 48 has supply inputs of 1.7 volts from voltage regulator circuit 32 (the recited "third supply voltage") and 5.0 volts from terminal 44 (the recited "fourth supply voltage"). *Id.* at 43–44 (citing Ex. 1002, 2:12–16, 2:29–31; Ex. 1004 ¶¶ 83, 84).

Similarly, Petitioner asserts that, as shown in Figure 1, inverter 46 of Schucker has an input coupled to node 47 (the recited "third node") and an output coupled to node 49 (the recited "fourth node"). *Id.* at 44–45 (citing Ex. 1002, 2:37–39, Fig. 1; Ex. 1004 ¶ 86). Petitioner also argues that Figure 1 shows that inverter 46 has supply inputs of 1.7 volts from voltage regulator circuit 32 (the recited "third supply voltage") and 5.0 volts from terminal 44 (the recited "fourth supply voltage"). *Id.* at 45–46 (citing Ex. 1002, 2:12–16, 2:29–31, 2:51–53, Fig. 1; Ex. 1004 ¶ 87).

Patent Owner does not contest Petitioner's argument that Schucker discloses the recitations of claim elements 1[e] and 1[f]. *See* PO Resp. 35–52.

Based on the complete record and for the reasons explained by Petitioner, we are persuaded that Petitioner has demonstrated sufficiently that Schucker discloses "a first inverter having an input coupled to said fourth node, an output coupled to said third node and supply inputs coupled between said third and fourth supply voltages" and "a second inverter having an input coupled to said third node, an output coupled to said fourth node and supply inputs coupled between said third and fourth supply voltages," as recited in claim 1.[9]

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[9] We also find that Patent Owner has waived any argument directed to these claim limitations. *See* Paper 9, 5.

b. Patent Owner's Arguments and Petitioner's Responses

The parties dispute whether Schucker discloses the limitation reciting "a protection layer which couples said first and second nodes to third and fourth nodes via first and second isolation paths, respectively" (i.e., the limitation Petitioner identifies as claim element 1[b]). As discussed below, the disputed issue turns on whether the claim term "couples" recited in claim element 1[b] requires the isolation paths to operate in a "push/pull" configuration.

Patent Owner asserts that the disputed term "couples" must describe (a) making an electrical connection during circuit operation (b) in response to an input signal. PO Resp. 3, 22–24. Specifically, Patent Owner contends that to "couple," as recited in the claim, the "protection layer" must (1) conduct electricity (i.e., pass electrical current), (2) in both isolation paths, (3) in opposite directions, and (4) at the same time. *Id.* at 3, 13, 20–25, 27–28, 35–36, 42, 48; Sur-reply 5–7. Patent Owner's proposed claim construction is predicated on Patent Owner's contention that the challenged claims require the recited "isolation paths" operate in a "'push/pull' configuration," where "*both* isolation paths" conduct electricity in opposite directions, "one pulling, the other pushing" (PO Resp. 35–36), i.e., "one path pulling current down as the other pushes current up" (Sur-reply 17). According to Patent Owner, this "push/pull" function is "critical to a core purpose of '588 embodiments: noise immunity" (PO Resp. 36) and is "a key aspect to the invention" of the '588 patent (*id.* at 51).

Patent Owner asserts that Schucker does not disclose the recited feature of coupling by isolation paths under its proposed claim construction, and, therefore, does not anticipate claim 1, because Schucker's isolation

paths can "only pull" in one isolation path (*id.* at 3) while the other isolation path is "non-conductive" (*id.* at 20, 36).

Petitioner disagrees with Patent Owner's proposed construction of the claim term "couples" requiring the alleged "push/pull" operation and asserts that the disputed limitation should be construed to encompass isolation paths that conduct electricity some of the time, without requiring current flow on both isolation paths in opposite directions at the same time. Reply 1–19.

In what follows, we first consider the plain meaning of the disputed term based on the claim language of claim 1, including Petitioner's plain meaning interpretation indicated in the Petition. We then consider the parties' arguments regarding the embodiments described in the Specification. Next, we consider the parties' arguments on whether the alleged "push/pull" feature argued by Patent Owner restricts the scope of the challenged claims to require "pushing current up" in one isolation path while "pulling current down" in the other isolation path. For the reasons explained below, we determine it does not. Lastly, we consider Patent Owner's claim construction and patentability arguments based on the alleged purpose of the '588 patent to improve noise immunity.

(i) Claim Language

In determining the broadest reasonable construction of a claim limitation, we begin with the language of the claim itself. *In re Power Integrations, Inc.*, 884 F.3d 1370, 1376 (Fed. Cir. 2018) ("[C]laim construction must begin with the words of the claims themselves." (quoting *Amgen Inc. v. Hoechst Marion Roussel, Inc.*, 457 F.3d 1293, 1301 (Fed. Cir. 2006))); *In re NTP, Inc.*, 654 F.3d 1279, 1288 (Fed. Cir. 2011) ("As with

any claim construction analysis, we begin with the claim language." (citing *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc))).

"Under a broadest reasonable interpretation, words of the claim must be given their plain meaning, unless such meaning is inconsistent with the specification and prosecution history." *Trivascular, Inc. v. Samuels*, 812 F.3d 1056, 1062 (Fed. Cir. 2016) (citing *Straight Path IP Grp., Inc. v. Sipnet EU S.R.O.*, 806 F.3d 1356, 1362 (Fed. Cir. 2015)).

As discussed above in Section III.B. (Claim Construction), Petitioner does not propose express constructions for any claim terms in the Petition and asserts that the challenged claims are unpatentable under the plain meaning interpretation of the claims. Pet. 24. As discussed above in the context of claim elements 1[b] and 1[c], Petitioner's application of Schucker to claim 1 appears to indicate that Petitioner's plain meaning interpretation of the claim term "couples" encompasses isolation paths that conduct electricity some of the time. *See* Pet. 28–31, 33–39. For example, in the context of claim element 1[b], Petitioner points to the cascode arrangement of transistors 26, 28, 34, and 36 depicted in Schucker's Figure 1 and argues that Schucker discloses "a first isolation path that *couples* the first node 15 to third node 47 via cascoded transistors 26 and 34, and a second isolation path that *couples* the second node 17 to fourth node 49 via cascoded transistors 28 and 36, as shown below in Fig. 1." *Id.* at 28 (emphases added) (citing Ex. 1002, 1:66–2:29, 2:32–42, 3:3–6, 5:49–60). In the context of claim element 1[c], Petitioner argues, citing the testimony of Dr. Chapman, that the "protection" function (to keep the first and second nodes within the first voltage range and keep the third and fourth nodes within the second voltage range) provided by Schucker's isolation paths results from the operation of

the N-channel and P-channel transistors forming the isolation paths in the cascode arrangement between the upper and lower nodes, where certain transistors in the isolation paths are turned on or off (i.e., conducting electricity through the isolation paths between the nodes under certain voltage conditions) when the input signal V_{IN} switches between 0.0 volts and 3.3 volts. *Id.* at 33–40 (citing Ex. 1002, Fig. 1, 1:55–57, 1:66–68, 2:9–29, 2:58–3:12, 3:1–3, 3:5–6, 3:10–12, 3:33–35, 3:38–47; Ex. 1004 ¶¶ 70–76). Thus, Petitioner's contentions presented in the Petition indicate that Petitioner's plain meaning interpretation of the claim term "couples" encompasses isolation paths that conduct electricity some of the time, e.g., potentially conductive paths that can conduct electricity under certain conditions.

In its Response, Patent Owner asserts that Petitioner's "implicit[]" plain meaning construction (PO Resp. 20) is erroneous because the term "couples" recited in claim element 1[b] does not "encompass both non-conductive and conductive paths." *Id.* at 24. In support of its proposed construction, Patent Owner points to the present tense of the verb "couples" and asserts that the only other present tense verbs recited in claim 1 are the verb "switches" recited in claim elements 1[a] and 1[d]—i.e., "the first circuit, 'responsive to an input signal . . . *switches* first and second nodes to opposite states' and the second circuit '*switches* said third and fourth nodes to opposite states . . . in response to switching of said first and second nodes.'" *Id.* at 23 (underlined emphases added). Patent Owner argues that because the phrases "responsive to an input signal" and "in response to switching of said first and second nodes" modify the present tense verb "switches" recited in claim elements 1[a] and 1[d], the present tense verb

"couples" recited in claim element 1[b] should similarly be interpreted to describe "an action in operation" "responsive to the input signal" carried out by the recited "protection layer." *Id.* at 24.

Patent Owner overlooks the fact that claim elements 1[a] and 1[d] expressly recite the phrases "responsive to an input signal" and "in response to switching of said first and second nodes," respectively, that modify the verb "switches," whereas claim element 1[b] recites no such adverbial phrase that restricts the verb "couples." This claim language shows that the patentee knew how to modify the recitation "switches" with "responsive to an input signal" and "in response to switching of said first and second nodes," respectively. If the patentee had intended to similarly restrict the verb "couples" recited in claim element 1[b], it could have done so using the same or similar language, but did not. *See Unwired Planet, LLC v. Apple Inc.*, 829 F.3d 1353, 1358–59 (Fed. Cir. 2016).

More importantly, even if we were to read in the phrase "responsive to an input signal" from claim element 1[a] to modify the term "couples" recited in claim element 1[b], Patent Owner does not explain adequately how such modified claim language (i.e., the present tense verb "couples" modified by the phrase "responsive to an input signal") requires current flow on both isolation paths so as to exclude electrical conduction in only one isolation path during operation.

In its Reply, Petitioner argues that claim 1 "simply recites that the protection layer couple the first circuit to the second circuit via isolation paths" and "does not impose any requirement that those isolation paths conduct current in opposite directions or that one isolation path 'push' current up while the other path 'pulls' current down." Reply 11.

We agree with Petitioner. At least based on the plain language of the claim, the claim term "couples" does not require current flow on both isolation paths at the same time, much less "pushing current up" in one isolation path while "pulling current down" in the other isolation path.

(ii) Embodiments Described in the Specification

Turning to the Specification, Patent Owner cites the following portions of the '588 patent as disclosing the alleged "push/pull" function.

> The complementary switching of the lower nodes 105 and 111 of the lower circuit 102 between opposite voltage levels within the limits of the lower voltage range VDDL/GNDL results in a *push/pull function* of the corresponding nodes 121 and 123 of the upper circuit 106.

Ex. 1001, 4:64–5:1 (emphasis added). "Each isolation path enables each of the nodes 105 and 111 to operate in a *push/pull configuration* to pull one of the nodes 121 and 123 towards GNDH and to *push the other node higher*." *Id.* at 5:19–23 (emphases added).

> When I goes high towards VDDL, the transistor 101 is turned on and the inverter 103 pulls its output low driving node 105 to GNDL. Node 105 going low turns off transistor 107 and causes inverter 109 to drive its output at node 111 high to VDDL. Node 105 going low tends to pull node 121 low whereas *driving node 111 high pushes node 123* to a higher voltage level. Node 121 is pulled low towards GNDH turning on transistor 135 and turning off transistor 133, so that the inverter 127 pulls node 123 high to VDDH.

Id. at 4:1–9 (emphasis added). PO Resp. 24–25 (citing Ex. 1001, 5:19–23, Fig. 1), 28–29 (citing Ex. 1001, 4:1–7), 43 (citing Ex. 1001, 5:22–23, 4:64–5:10).

Citing the testimony of Dr. Ipek, Patent Owner asserts that a person of ordinary skill in the art would recognize that "the only way for an 'isolation path' to 'enable' a node to affect another node's voltage level . . . is for the isolation path to 'couple' the nodes, i.e., electrically connect the nodes so that *current can flow* from one node to the other." PO Resp. 25 (emphasis added) (quoting Ex. 2002 ¶ 68). Thus, Patent Owner argues that in order to pull and push voltages in the '588 patent's push/pull operation (*id.* at 35–36; Sur-reply 5), the recited "isolation paths" must pass current up and down, "one path pulling current down as the other pushes current up" (Sur-reply 17).

In its Reply, Petitioner asserts that Patent Owner disregards the disclosure in the portions of the Specification reproduced above which describes that "node 123 *is pulled high* because node 121 was pulled low by the opposite isolation path, which through the action of the cross-coupled inverters drives node 123 high." Reply 15 (citing Ex. 1001, 4:7–9; Ex. 1013 ¶ 13). In the cited paragraph of his Reply Declaration, Dr. Chapman explains

> In reality, the third and fourth nodes are actually "pulled" to logic high by the cross-coupled inverters. The '588 patent explains that "[n]ode 121 is pulled low towards GNDH turning on transistor 135 and turning off transistor 133, so that the inverter 127 pulls node 123 high to VDDH." Node 123 is *pulled high* because node 121 was pulled low by the opposite isolation path, which through the action of the cross-coupled inverters drives node 123 high. Specifically, when node 121 is pulled low, the gates of PMOS transistor 135 and NMOS transistor 133 in inverter 127 are pulled low. The low value at the gate of PMOS transistor 135 means transistor 135 is on, while the low value at the gate of NMOS transistor 133 means transistor 133 is off.

> Because transistor 135 is on, the output of inverter 127 at node 123 is pulled high to VDDH.

Ex. 1013 ¶ 13 (underlined emphasis added) (citing Ex. 1001, 4:7–9). In other words, Dr. Chapman opines that the ’588 patent describes, when the input to the level shifter circuit (depicted in Figure 1) goes high toward VDDL, node 123 is *pulled high* by inverter 127, *not pushed up* by node 111 via transistors 115 and 119, as Patent Owner contends (*see, e.g.*, PO Resp. 23–24 (citing Ex. 1001, 4:5–8)).

Nonetheless, the portion of the Specification cited by Patent Owner also states "[n]ode 105 going low tends to pull node 121 low whereas driving node 111 high *pushes node 123 to a higher voltage level*." Ex. 1001, 4:5–8. We note that the ’588 patent describes up-shift circuit 100 depicted in Figure 1 as an "exemplary embodiment." *Id.* at 2:51–53. Thus, the ’588 patent appears to disclose alternative embodiments to drive the third or fourth nodes (nodes 121 or 123 depicted in Figure 1) high to VDDH: push high by nodes 105 or 111, or pull high by cross-coupled inverters 125 or 127. In other words, the "push up" feature argued by Patent Owner appears to be a feature of an alternative embodiment described in the ’588 patent.

In addition, during the trial hearing, Patent Owner acknowledged that the ’588 patent describes an embodiment where the alleged "push/pull" operation is not possible because no "pushing up" can take place. *See* Tr. 78:12–19, 79:21–80:9. The relevant portion of the Specification of the ’588 patent describing the operation of up-shift circuit 100 depicted in Figure 1 is set forth below:

> The transistors 113 and 115 receive VDDL at their gates thereby *preventing the voltage of the lower circuit 102 from exceeding VDDL*. The transistors 117 and 119 receive GNDH at their gates

> thereby *preventing the voltage of the upper circuit 106 from falling below GNDH*. . . . The voltage level across the entire up-shift circuit 100, or VDDH to GNDL, can exceed the allowable maximum voltage of any given thin-gate device since none of the devices are exposed to the entire voltage range. And although GNDH may have a smaller magnitude than VDDL, <u>GNDH can be the same voltage as VDDL or even a little higher</u> to maximize the voltage differential between VDDH and GNDL. In this manner, the overall switching is relatively fast since smaller thin-gate devices are used and yet the voltage range is extended by operation of the protection layer 104 separating the lower and upper circuits 102 and 106.

Ex. 1001, 4:36–60 (italicized and underlined emphases added). As shown in the portion of the Specification reproduced above, the ’588 patent describes an embodiment where protection layer 104 prevents the voltage of lower circuit 102 from exceeding VDDL and prevents the voltage of upper circuit 106 from falling below GNDH. In other words, in this embodiment, the highest possible voltage for lower circuit 102, including nodes 105 and 111 (*see id.*, Fig. 1), is VDDL, and the lowest possible voltage for upper circuit 106, including nodes 121 and 123, is GNDH. As also shown above with underlined emphasis, the ’588 patent describes an embodiment where GNDH, the lowest possible voltage for nodes 121 and 123 (the recited “third and fourth nodes”), is *higher* than VDDL, the highest possible voltage for nodes 105 and 111 (the recited “first and second nodes”). *Id.* at 4:54–56. The ’588 patent describes that this embodiment “maximize[s] the voltage differential between VDDH and GNDL” so that “the overall switching is relatively fast.” *Id.* at 4:55–57.

Because current can only flow from a higher voltage to a lower voltage (*see, e.g.*, Reply 13 (citing Ex. 1012, 110:13–111:5); Tr. 14:10–11, 44:7–11), in this embodiment it is not possible for current to flow up in

either isolation path (i.e., from node 111 to node 123 or from node 105 to node 121) to push the voltages at node 121 or node 123 up to a higher voltage. Indeed, during the oral hearing, counsel for Patent Owner admitted that the alleged "push/pull" operation is not possible in this embodiment.

> JUDGE WEINSCHENK: -- is that portion, Column 4, Lines 54 to 56 that talks about the comparison, is -- does Claim 1 cover all the different options?
>
> MR. WEATHERWAX: No.
>
> JUDGE WEINSCHENK: And how do we know that?
>
> MR. WEATHERWAX: Because -- well, under our construction, it doesn't because *not all of those can possibly do push/pull*.

Tr. 78:12–19 (emphasis added).

> JUDGE WEINSCHENK: So in that portion of the spec, it says GNDH can be the same or even a little higher than VDDL; you're saying that that portion of the spec is not covered by Claim 1?
>
> MR. WEATHERWAX: Well, part of it is, but not that statement. Not where -- I just want to make sure I'm talking about the correct line here.
>
> JUDGE WEINSCHENK: Sure.
>
> MR. WEATHERWAX: We're talking about Line 54 of Column 4?
>
> JUDGE WEINSCHENK: Correct.
>
> MR. WEATHERWAX: Yes. That sentence, GNDH can be even a little higher to maximize the voltage differential between VDDH and GNDL? *Yes. That would not allow push/pull*.

Tr. 79:21–80:9 (emphases added). Thus, the evidence of record shows that the ’588 patent describes embodiments that do not include the “push/pull” feature argued by Patent Owner.

In general, “a particular embodiment appearing in the written description may not be read into a claim when the claim language is broader than the embodiment.” *SuperGuide Corp. v. DirecTV Enters., Inc.*, 358 F.3d 870, 875 (Fed. Cir. 2004) (citation omitted). As discussed above in the context of the plain meaning of the disputed limitation, claim 1 does not state, explicitly or by necessary implication, that the recited “isolation paths” must perform a “push/pull” operation. And, as also discussed above, not all the embodiments described in the Specification require a “push/pull” operation. Thus, unless one of the established exceptions, such as lexicography or disavowal, applies, claim 1 is not restricted to require a “push/pull” operation described in the embodiments.

(iii) Petitioner’s Additional Responses

In its Reply, Petitioner presents additional arguments to show that claim 1 does not require a “push/pull” operation—one based on dependent claim 4, another based on a preferred embodiment described in the Specification. We discuss each in turn.

Claim 4 depends from claim 1 and further recites

> wherein said protection layer comprises:
>
> a first N-channel device having a gate receiving said second supply voltage, a source coupled to said first node and a drain;
>
> a first P-channel device having a gate receiving said third supply voltage, a source coupled to said third node and a drain coupled to said drain of said first N-channel device;
>
> a second N-channel device having a gate receiving said second

> supply voltage, a source coupled to said second node and a drain; and
>
> a second P-channel device having a gate receiving said third supply voltage, a source coupled to said fourth node and a drain coupled to said drain of said second N-channel device.

Ex. 1001, 17:34–49.

Pointing to the additionally recited limitations of claim 4, Petitioner asserts that claim 4 shows "the level shifter in claim 1 does not require a 'push/pull configuration.'" Reply 16. Petitioner argues that dependent claim 4 "recites the specific configuration of the transistors in the protection layer," namely, "the sources of the NMOS transistors are connected to the first and second nodes, . . . the sources of the PMOS transistors are connected to the third and fourth nodes, and the drains of the NMOS transistors are tied to the drains of the PMOS transistors." *Id.* To illustrate its argument, Petitioner presents an annotated version of Figure 1 of the '588 patent. Figure 1, as annotated by Dr. Chapman in different colors, is reproduced below.

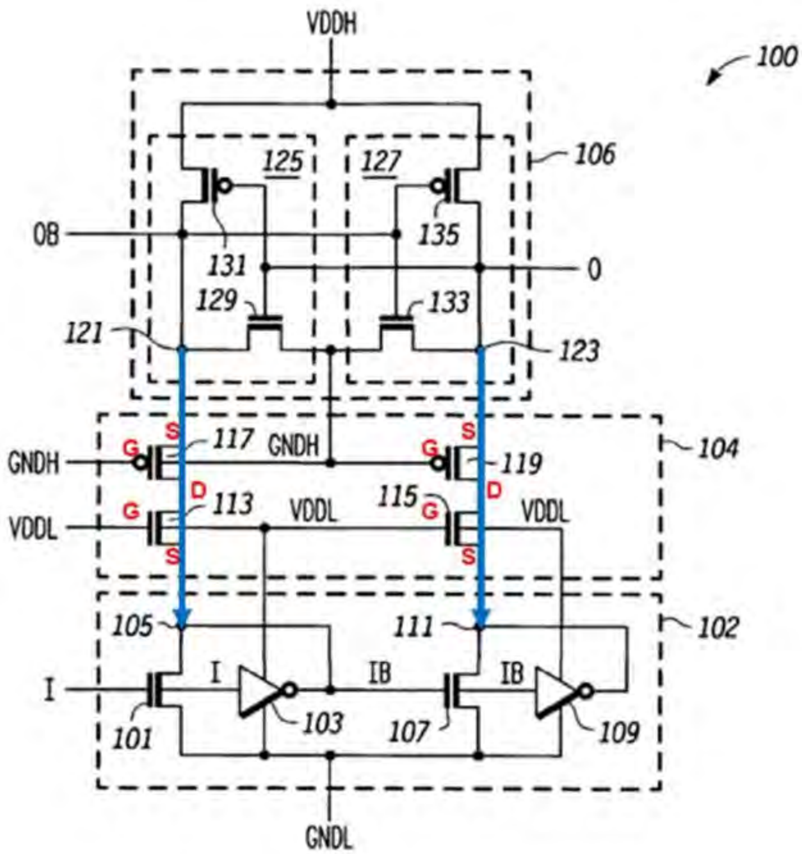


FIG. 1

Id. at 17; Ex. 1013 ¶ 15. Annotated Figure 1 reproduced above shows Dr. Chapman's illustration of the arrangement of N-channel devices and P-channel devices in the protection layer of the '588 patent, as recited in claim 4, with the sources (labeled S in red) of the N-channel devices coupled to the first and second nodes, the sources of the P-channel devices coupled to the third and fourth nodes, and the drains (labeled D in red) of the N-channel devices coupled to the drains of the P-channel devices. Ex. 1013 ¶ 15; Reply 16–17.

The parties' declarants agree that in P-channel transistors the current flows from the source to the drain and in N-channel transistors the current flows from the drain to the source. Ex. 1013 ¶ 15; Ex. 1012, 7:12–19.

Noting this fact, Dr. Chapman testifies that, as illustrated in the Annotated Figure 1 reproduced above, when the transistors in the isolation paths are arranged as recited in claim 4, current in the isolation paths (depicted with blue arrows) "will only flow from the third and fourth nodes to the first and second nodes." Ex. 1013 ¶ 15; Reply 16.

Petitioner asserts, therefore, claim 4 requires the isolation paths to conduct in the same direction—pulling current from the second circuit to the first circuit when an isolation path is conducting—and *not* in opposite directions as Patent Owner contends. Reply 17. That is, the protection layer recited in claim 4 can only "pull" current down (and not necessarily at the same time)[10] and, therefore, does not perform the "push/pull" function argued by Patent Owner. Petitioner argues, because claim 4 depends from claim 1, claim 1 cannot be construed to conflict with the requirements of claim 4. *Id.* at 17–18.

Patent Owner disputes Petitioner's argument that the isolation paths of claim 4 must only "pull" and not "push." Sur-reply 22. Patent Owner argues, citing the deposition testimony of Dr. Chapman, "[i]t is *undisputed* that, for each symmetrical CMOS transistor *in each isolation path*, the electrode that is the 'source' and the electrode that is the 'drain' are *not fixed*, and *can switch back and forth* depending on which electrode is at a

[10] Dr. Chapman testifies that in the '588 patent the switching of nodes 121 and 123 to opposite states takes place by pulling one node low in one isolation path, which causes the cross-coupled inverters to pull the other node high in the opposite isolation path. *See* Ex. 1013 ¶ 13; *see also* Reply 15 (presenting the same argument) (citing Ex. 1013 ¶ 13).

higher voltage potential." *Id.* (emphases added) (citing Ex. 2009,[11] 19:20–21:3; Exs. 2011, 2012).

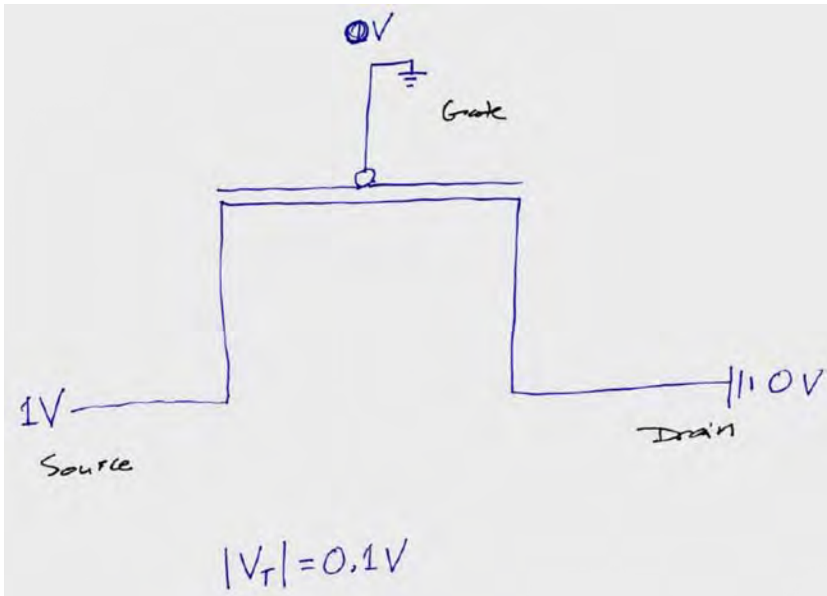
Patent Owner mischaracterizes Dr. Chapman's testimony. The record shows that, during the Second Deposition of Dr. Chapman, Patent Owner's counsel provided to Dr. Chapman hand-drawn diagrams (Exs. 2011, 2012) depicting NMOS or PMOS transistors and asked Dr. Chapman to label the source, the drain, and the gate of the depicted transistors based on Patent Owner's counsel's explanation of the voltages indicated on the diagrams. Ex. 2009, 18:21–20:8. When Dr. Chapman complied, Patent Owner's counsel asked how Dr. Chapman determined the location of the drain on the hand-drawn diagram on Exhibit 2012. *Id.* at 20:9–11. Dr. Chapman answered as follows:

> A. As you mentioned before, MOSFETs are symmetrical. So it's somewhat arbitrary. *Typically*, we *label* circuits in a style for PMOS that places the drain at the lower voltage and the source at the higher voltage. *That's the typical convention* that I've learned anyway.

Id. at 20:12–17 (emphases added).

[11] The Sur-reply mistakenly cites Exhibit 2013 as the record of the Second Deposition of Dr. Chapman.

The hand-drawn diagram on Exhibit 2012 Patent Owner's counsel provided to Dr. Chapman during the Second Deposition of Dr. Chapman is reproduced below.



The diagram above shows a schematic of a PMOS transistor Patent Owner's counsel provided to Dr. Chapman during the Second Deposition of Dr. Chapman, with Dr. Chapman's labeling of the source, the drain, and the gate of the transistor made during his deposition based on Patent Owner's counsel's explanations of the voltages indicated on the diagram. Ex. 2009, 18:20–19:18.

Thus, the record shows that, contrary to Patent Owner's assertion, Dr. Chapman did *not* make an "undisputed" admission during his Second Deposition that "for each symmetrical CMOS transistor *in each isolation path*, the electrode that is the 'source' and the electrode that is the 'drain' are *not fixed*, and *can switch back and forth* depending on which electrode is at a higher voltage potential." *See* Sur-reply 22 (emphases added); Ex. 2009, 18:20–20:17. Dr. Chapman's *labeling* of the source and the drain on the

schematic based on the "typical convention" of "labeling" a schematic of a transistor in general is a far cry from the alleged "undisputed" admission by Dr. Chapman that the "source" and the "drain" of a transistor in the isolation paths of the '588 patent "can switch back and forth depending on which electrode is at a higher voltage potential" during the operation the isolation paths. *See* Sur-reply 22; Ex. 2009, 18:20–20:17; Exs. 2011, 2012. More to the point, Dr. Chapman's testimony on the "typical convention" of "labeling" a schematic of a transistor in general says nothing about whether the '588 patent contemplates using transistors that can switch their sources and drains during operation, and, more specifically, whether the protection layer recited in claim 4 is expected or required to switch the sources and the drains of the recited N-channel devices and P-channel devices during the operation of the protection layer.

Regarding claim 4, Dr. Ipek opines in his Declaration that "[t]he devices in the protection layer's isolation paths in the corresponding embodiment are CMOS devices that *can flip* which of their terminals is the source and which is the drain depending on which terminal is at a higher voltage at any given point in time" and that claim 4 "recites the transistors' source and drain, and those can change with time." Ex. 2002 ¶ 89 (emphasis added). Dr. Ipek, however, does not explain adequately why the N-channel devices and the P-channel devices recited in claim 4 are expected or required to switch their sources and drains during the operation of the protection layer. *See id.* In addition, Dr. Ipek does not cite any supporting evidence. *See id.* Thus, we find Dr. Ipek's testimony unpersuasive as conclusory and unsupported.

More importantly, Patent Owner does not cite, nor do we discern, anything in the Specification that indicates or suggests that the ’588 patent contemplates using transistors that can switch their sources and drains during the operation of the protection layer.

We note that the recitations of claim 4 corresponds to an exemplary embodiment described in the Specification (in reference to Figure 1) as follows:

> The protection layer 104 includes an N-channel transistor 113 having a source coupled to node 105 and another N-channel transistor 115 having a source coupled to node 111. VDDL is provided to the gates of transistors 113 and 115. The drain of transistor 113 is coupled to the drain of a P-channel transistor 117 and the drain of transistor 115 is coupled to the drain of another P-channel transistor 119. The source of transistor 117 is coupled to a node 121 and the source of transistor 119 is coupled to another node 123. . . . GNDH is provided to the gates of transistors 117 and 119.

Ex. 1001, 3:4–16. Patent Owner does not cite, nor do we discern, anything in the Specification that indicates or suggests the specific arrangement of the sources and drains of the transistors recited in claim 4 (and described in this embodiment) will change during the operation of the level shifter circuit.

Therefore, we find Patent Owner’s argument and Dr. Ipek’s testimony about flipping or changing back and forth of the sources and drains of the N-channel devices and P-channel devices recited in claim 4 unpersuasive as unsupported by evidence of record.

We also note that claim 4 is an apparatus claim reciting the specific arrangement of the transistors and nodes recited in the claim. That is, claim 4 recites limitations specifying that the sources of the N-channel devices are coupled to the first and second nodes, the sources of the

P-channel devices are coupled to the third and fourth nodes, and the drains of the N-channel devices are coupled to the drains of the P-channel devices. Ex. 1001, 17:34–49. By arguing these express recitations are "not fixed" (Sur-reply 22), Patent Owner is essentially asking we disregard all of the limitations recited in the body of claim 4. We declined to do so because, among other reasons, "meaning should be given to all of a claim's terms." *Dell Inc. v. Acceleron, LLC*, 818 F.3d 1293, 1300 (Fed. Cir. 2016) (citing *Bicon, Inc. v. Straumann Co.*, 441 F.3d 945, 950 (Fed. Cir. 2006)).

Based on the complete record, we agree with Petitioner that claim 4 does not require the recited "protection layer" perform the alleged "push/pull" function. Because independent claim 1 must encompass the subject matter of its dependent claim 4, we determine, absent a compelling reason to the contrary, claim 1 does not require the "protection layer" and the "isolation paths" to operate in a "push/pull" configuration.

Next, Petitioner points to a preferred embodiment described in the Specification and asserts that the alleged "push/pull" operation is not possible under the voltage conditions specified in the preferred embodiment. Reply 12–15. Petitioner asserts that the '588 patent discloses "[i]n the more specific embodiments illustrated herein, the lower voltage range [that is, the voltage across any specific transistor] is up to 1.2 V whereas the higher or full voltage range is between ground (0 V) and 3.3–3.6 V." *Id.* at 12 (citing Ex. 1001, 1:37–41). Citing the testimony of Dr. Chapman, Petitioner argues that when these voltage conditions are applied to up-shift circuit 100 of the '588 patent, "VDDH must be at least 3.3 V, GNDH must be greater than or equal to 2.1 V (3.3 V minus 1.2 V), VDDL must be less than or equal 1.2 V, and GNDL must equal 0.0 V." *Id.* (citing Ex. 1013 ¶ 8). Petitioner further

asserts that because the voltages at the third and fourth nodes are always between VDDH and GNDH, the voltages at those nodes will range from 2.1 volts to 3.3 volts. *Id.* (citing Ex. 1001, 4:23–26; Ex. 1013 ¶ 9). Petitioner similarly contends that because the voltages at the first and second nodes are always between VDDL and GNDL, the voltages at these nodes will range from 0.0 volts to 1.2 volts. *Id.* (citing Ex. 1001, 4:20–23; Ex. 1013 ¶ 9). Thus, Petitioner argues that in this preferred embodiment "the voltage at the third node *is always* greater than the voltage at the first node, and the voltage at the fourth node *is always* greater than the voltage at the second node." *Id.* at 13 (citing Ex. 1013 ¶ 10).

Petitioner argues, therefore, in this preferred embodiment, current will never flow up from the first node to the third node to "push" the voltage in the third node to a higher voltage level.[12] *Id.* at 14 (citing Ex. 1013 ¶¶ 11, 12). Petitioner similarly contends that because the voltage at the fourth node is always greater than the voltage at the second node, current will never flow up from the second node to the fourth node to "push" the voltage in the fourth node up to a higher voltage level. *Id.* (citing Ex. 1013 ¶¶ 11, 12). Petitioner argues, therefore, no "push/pull" operation is possible in this preferred embodiment. *Id.* at 15.

In its Sur-reply, Patent Owner asserts that the disclosure of the '588 patent cited by Petitioner appears in the "Background of the Invention" section of the Specification, and, therefore, does not relate to any "voltage range experienced by an individual level shifter" disclosed in the '588

[12] Citing the deposition testimony of Dr. Ipek, Petitioner notes the undisputed fact that current can only flow from a higher voltage to a lower voltage. Reply 13 (citing Ex. 1012, 110:13–111:5).

patent. Sur-reply 7, 9. To the extent Patent Owner argues the disclosure relied upon by Petitioner is not part of any embodiment of the invention described in the '588 patent, we disagree with Patent Owner's argument because the cited passage states that it describes the voltage ranges of "the more specific *embodiments* illustrated herein." Ex. 1001, 1:37–38 (emphasis added).

Next, Patent Owner contends that applying the specific voltages to the level shifter circuit of Figure 1, as proposed by Petitioner, is inconsistent with the disclosures of the '588 patent because doing so would break the thin-gate oxide transistors used in the circuit. Sur-reply 9–16. To prove its point, Patent Owner goes through a series of calculations and circuit analysis under Petitioner-specified voltage conditions to determine the voltages allegedly experienced by each transistor, inverter, node, and terminal of the level shifter circuit, when the input to the level shifter circuit is at logic high (1.2 volts). *Id.* at 10–16. Based on its calculations and circuit analysis, Patent Owner asserts that at least two transistors, namely, transistors 115 and 117 in the protection layer, would experience a voltage range of 2.1 volts across their terminals. *Id.* at 11–16. Patent Owner argues that 2.1 volts is greater than "the maximum 1.5 V voltage range that the Patent teaches will *break* the thin-gate transistors used for those transistors in the preferred embodiments." *Id.* at 16 (citing Ex. 1001, 4:29–36).

Patent Owner acknowledges, however, that under Petitioner specified voltage conditions, "[t]ransistors 117 and 115 are *off*, so they *will not pass voltage potential* from the lower electrode to the upper electrode and vice versa." *Id.* at 14 (emphases added). Patent Owner's argument is unpersuasive because Patent Owner does not explain adequately how

turned-off transistors that cannot "pass voltage potential" (or pass current) across their electrodes would "experience" a voltage potential across their electrodes to cause them to break. *See id.* at 16.

Based on the complete record and the foregoing discussion of the arguments and evidence presented by Petitioner and Patent Owner, we determine that, absent a compelling reason to the contrary, claim 1 does not require the recited "protection layer" and "isolation paths" to operate in a "push/pull" configuration.

(iv) Whether the Specification Compels Claim Interpretation Requiring "Push/Pull"

Patent Owner appears to argue that the facts of this case present a compelling reason to depart from the general rule against importing limitations from a particular embodiment described in the Specification. In its Response, Patent Owner asserts that the "push/pull" configuration described in the Specification is "a key aspect to the invention described and claimed by the Patent" (PO Resp. 51) because it relates to a purpose of the invention, which is to provide "improved noise immunity" (*id.* at 49–50 (citing Ex. 1001, 1:7–9)). Patent Owner also contends that "[t]he distinction between 'push/pull' and 'only pull' is critical to a core purpose of '588 embodiments: noise immunity." *Id.* at 36. Citing *In re Abbott Diabetes Care Inc.*, 696 F.3d 1142 (Fed. Cir. 2012), Patent Owner asserts that the challenged claims should be interpreted narrowly to be restricted to this "purpose of the invention." PO Resp. 24 (citing *Abbott Diabetes Care*, 696 F.3d at 1149).

As discussed above, in general "a particular embodiment appearing in the written description may not be read into a claim when the claim language

is broader than the embodiment." *SuperGuide*, 358 F.3d at 875. Established exceptions to this general rule include lexicography and disavowal. *See, e.g.*, *GE Lighting Sols., LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1309 (Fed. Cir. 2014) ("the specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal") (citation omitted). Here, Patent Owner does not argue lexicography or disavowal.

Courts have also recognized that, under certain circumstances, "the embodiments of the invention set forth in the specification constituted the invention itself, in spite of claim language that could, in the abstract, be interpreted more broadly." *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 907 (Fed. Cir. 2004); *see also Wisconsin Alumni Research Found. v. Apple Inc.*, 905 F.3d 1341, 1351 (Fed. Cir. 2018) ("Where . . . a patent repeatedly and consistently characterizes a claim term in a particular way, it is proper to construe the claim term in accordance with that characterization." (internal quotation marks omitted) (citations omitted)), *cert. denied*, 140 S. Ct. 44 (2019). "Whether a claim must, in any particular case, be limited to the specific embodiment presented in the specification, depends in each case on the specificity of the description of the invention and on the prosecution history." *Liebel-Flarsheim*, 358 F.3d at 907 (quoting *Cultor Corp. v. A.E. Staley Mfg. Co.*, 224 F.3d 1328, 1331 (Fed. Cir. 2000)); *see also In re Power Integrations, Inc.*, 884 F.3d 1370, 1375 (Fed. Cir. 2018) ("[T]he board must always "consider the claims in light of the specification and teachings in the underlying patent." (citation omitted)).

In *Abbott Diabetes Care* cited by Patent Owner, the Federal Circuit construed the disputed term "electrochemical sensor" under the BRI

standard to exclude "external connection cables or wires," in spite of the claim language lacking express requirement for such exclusion, because (1) "the claims themselves suggest connectivity without the inclusion of cables or wires," (2) "*every embodiment* disclosed in the specification shows an electrochemical sensor without external cables or wires," and (3) the patents at issue "'*repeatedly, consistently, and exclusively*' depict an electrochemical sensor without external cables or wires while simultaneously *disparaging* sensors with external cables or wires." 696 F.3d at 1149–50 (emphases added).

As discussed above, here, unlike *Abbott Diabetes Care*, there is nothing in the claim language that suggests that the recited "isolation paths" must operate in a "push/pull" configuration. In addition, unlike *Abbott Diabetes Care*, *not every embodiment* disclosed in the Specification here requires a "push/pull" function because, as discussed above, the Specification describes several embodiments where the "push/pull" operation is not possible. Similarly, here, in contrast to *Abbott Diabetes Care*, the Specification does *not* "repeatedly, consistently, and exclusively" describe that a protection layer or isolation paths must operate in a "push/pull" configuration because in several examples described in the Specification the protection layer and isolation paths cannot push up voltages or current. Nor is there any statement in the Specification disparaging "only pull" operations, which Patent Owner distinguishes from the "push/pull" operation (*see, e.g.*, PO Resp. 36, 51).

In *Abbott Diabetes Care*, the court also found that "the primary purpose of the invention" to provide "a small, compact device that can operate the sensor and provide signals to an analyzer without substantially

restricting the movements and activities of the patient" was a factor, in addition to the factors discussed above, supporting the restrictive construction of "electrochemical sensor" to exclude "external connection cables or wires." 696 F.3d at 1149.

In this case, Patent Owner asserts that "[t]he distinction between 'push/pull' and 'only pull' is critical to a core purpose of '588 embodiments: noise immunity." PO Resp. 36. Patent Owner argues that the "push/pull" configuration is "useful in providing noise immunity" (*id.* at 50 (citing Ex. 1001, 1:7–9)) because it "adds noise immunity to the circuit and helps the circuit reliably switch" (*id.* at 51 (citing Ex. 2002 ¶ 92). Patent Owner further asserts that the "'complementary' action" of the "push/pull" operation of the protection layer on "both [isolation] paths" "accomplishes the inventors' express goal of reducing susceptibility to noise" by "canceling [the noise] out between the isolation paths, one "pushing," the other one "pulling" the opposite direction." Sur-reply 5–6 (citing Ex. 1001, 1:59–66; 4:5–7, 4:64–5:1, 5:19–23; 9:55–58, 9:66–10:5, 10:36–40, 10:59–62; Ex. 2002 ¶¶ 33, 37–38, 43, 46, 61–62, 67, 68).

The cited passages of the Specification, however, do not describe that the "push/pull" operation is necessary to achieve improved noise immunity or reduced susceptibility to noise. For example, the Specification states as follows in the "BACKGROUND OF THE INVENTION" section: "The present invention relates in general to electronic devices, and more specifically to a cascadable level shifter cell with improved noise immunity" (Ex. 1001, 1:7–9); "It is desired to implement level shifters and output buffers capable of operating between lower level chip voltages and higher voltage peripheral components and circuits that are less susceptible to

noise." (*id.* at 1:64–66). These passages do not mention "push/pull" or two isolation paths conducting in opposite directions.

In paragraph 46 of his Declaration cited by Patent Owner, Dr. Ipek opines as follows:

> [T]he Figure 1 embodiment of the '588 Patent presents a circuit that, in response to the input signal, *cancels out noise* through *a "push/pull" action on both of its protective layer's isolation paths*. This *complementary "push/pull" action cancels out noise* because, when the two isolation paths conduct in opposite directions, any noise in the current on the two paths will tend to cancel each other out. . . . the Patent identifies process, temperature, and other environmental noise effects as all being addressed by *this complementary action*.

Ex. 2002 ¶ 46 (emphases added) (citing Ex. 1001, 4:61–5:11). Contrary to Dr. Ipek's testimony, the cited portions of the Specification do *not* describe that the "complementary action" of "push/pull" of the protection layer or the isolation paths "cancels out noise" or improves noise immunity. Instead, the Specification describes that canceling out noise or improved noise immunity is achieved by the complementary switching operation of the lower and upper circuits (i.e., the recited "first circuit" and "second circuit"), including the lower and upper nodes (i.e., the recited "first and second nodes" and "third and fourth nodes").

For example, the Specification states as follows: "The pair of *circuits 102 and 106, each including complementary switched nodes*, *significantly improves noise immunity* as compared to conventional level shift circuits." Ex. 1001, 4:61–63 (emphasis added). We find this passage to be a clear and unambiguous statement that improved noised immunity is achieved by the complementary switching performed by the first and second circuits.

Although the Specification next states "[t]he complementary switching of the lower nodes 105 and 111 of the lower circuit 102 between opposite voltage levels within the limits of the lower voltage range VDDL/GNDL *results in a push/pull function* of the corresponding nodes 121 and 123 of the upper circuit 106" (*id.* at 4:64–5:1 (emphasis added)), it does *not* state that this "push/pull function" reduces or cancels out noise in the system. Rather, the Specification states that "*[a]ny noise* in the system tends to *cancel* or is *otherwise compensated* by *the complementary switching action* to ensure dependable switching action regardless of environment changes, temperature variations, or process anomalies and variations." *Id.* at 5:5–10 (emphases added). These passages confirm the clear and unambiguous statement in the Specification discussed above that improved noised immunity is achieved by the complementary switching performed by the first and second circuits.

As discussed above, the Specification discloses several embodiments that do not allow a "push/pull" function, such as the embodiment where GNDH is higher than VDDL, as well as the embodiment corresponding to claim 4. In all of these embodiments, however, the level shifter circuit have the pair of lower and upper circuits (the recited "first circuit" and "second circuit"), each including complementary switched nodes, such that the upper circuit performs the complementary switching of the upper nodes in response to the lower circuit's complementary switching of the lower nodes. *See, e.g.*, *id.* at 4:15–26, 4:53–63. In other words, all of the embodiments discussed above include complementary switching by the first and second circuits, but *not* all embodiments require "push/pull." Because the Specification states unambiguously that the complementary switching

performed by the first and second circuits cancels out noise in the system or improve noise immunity, a "push/pull" function is *not* necessary to improve noise immunity or reduce noise in the system. Thus, to the extent improved noise immunity is a purpose of the invention, as Patent Owner argues, a "push/pull" function is not necessary to achieve that purpose. Accordingly, unlike *Abbott Diabetes Care*, Patent Owner's argument here about the purpose of invention of the '588 patent does *not* support a restrictive claim construction requiring a "push/pull" operation.

In summary, none of the factors existing in *Abbott Diabetes Care* are present in this case. Thus, claim construction in this case is governed by the general principle that "a particular embodiment appearing in the written description may not be read into a claim when the claim language is broader than the embodiment." *SuperGuide*, 358 F.3d at 875; *see also WesternGeco LLC v. ION Geophysical Corp.*, 889 F.3d 1308, 1323–24 (Fed. Cir. 2018) ("It is well established that claims are not limited to preferred embodiments, unless the specification clearly indicates otherwise." (citing *Comaper Corp. v. Antec, Inc.*, 596 F.3d 1343, 1348 (Fed. Cir. 2010) ("[T]his court has repeatedly cautioned against limiting claims to a preferred embodiment."))). As discussed above, the Specification describes several embodiments that do not require a "push/pull" operation. Accordingly, based on the complete record and the foregoing discussion of the arguments and evidence presented by Petitioner and Patent Owner, we determine that the claim term "couples" recited in claim 1 does *not* require the isolation paths to operate in a "push/pull" configuration. Instead, we construe the claim term "couples" according to its plain meaning and determine that the term "couples"

encompasses potentially conductive paths that can conduct electricity under certain conditions.

Under this claim construction, we determine, based on the complete record and for the reasons explained by Petitioner in the context of claim elements 1[b] and 1[c] (Sections III.C.3.a(iii) & (iv) above), we determine that Petitioner has demonstrated sufficiently that Schucker discloses "a protection layer which couples said first and second nodes to third and fourth nodes via first and second isolation paths, respectively," as recited in claim 1.

We also note that the challenged independent claims, claims 1 and 17, include express recitations that "a first circuit . . . switches first and second nodes to opposite states" and "a second circuit . . . switches [the] third and fourth nodes to opposite states . . . in response to switching of [the] first and second nodes." Ex. 1001, 16:57–59, 16:66–17:3, 20:24–26, 20:37–39. Thus, to the extent that the descriptions in the Specification regarding noise immunity defines the invention or "constitute[s] the invention itself," *see Liebel-Flarsheim*, 358 F.3d at 907, the challenged claims expressly recite the operations of the recited first and second circuits that achieve noise immunity, i.e., the complementary switching of the lower and upper nodes of the first and second circuits.

As discussed above in the context of claim element 1[a] and claim element 1[d], Petitioner persuasively demonstrates that Schucker discloses "a first circuit . . . switches first and second nodes to opposite states" and "a second circuit . . . switches [the] third and fourth nodes to opposite states . . . in response to switching of [the] first and second nodes," as recited in claim 1. *See* Pet. 26–28, 40–42. As also discussed above, Patent Owner

does not contest Petitioner's argument that Schucker discloses the recitations of claim elements 1[a] and 1[d]. *See* PO Resp. 35–52. Thus, to the extent the challenged claims are to be construed to require noise immunity, we determine that Schucker discloses the claimed subject matter of noise immunity.

c. Conclusion on Claim 1

Based on the complete record and the foregoing discussion of the arguments and evidence presented by Petitioner and Patent Owner, we determine that Petitioner has demonstrated sufficiently that Schucker discloses all limitations recited in claim 1. Accordingly, based on the complete record, we determine that Petitioner has demonstrated, by a preponderance of the evidence, that claim 1 is unpatentable under 35 U.S.C. § 102 as anticipated by Schucker.

4. Discussion — Independent Claim 17

Claim 17 is a method claim that recites limitations similar to the limitations recited in claim 1. *Compare* Ex. 1001, 16:56–17:11 (claim 1), *with id.* at 20:23–42 (claim 17). Petitioner largely refers to its discussion of the limitations of claim 1 to argue that Schucker discloses all of the limitations of claim 17. *See* Pet. 54–60. For instance, Petitioner asserts that Schucker discloses "providing a first circuit that switches first and second nodes within a first voltage range to opposite states in response to an input signal," as recited in claim 17, for the same reasons discussed in the context of claim element 1[a]. *Id.* at 54–55 (citing *id.* § IX.A.1.b.). Similarly, Petitioner contends that Schucker discloses "coupling the first node to a third node through a first isolation path which keeps the first node within the first

voltage range and which keeps the third node within a second voltage range," and "coupling the second node to a fourth node through a second isolation path which keeps the second node within the first voltage range and which keeps the fourth node within the second voltage range," as recited in claim 17, for the reasons discussed in the context of claim elements 1[b] and 1[c]. *Id.* at 55–57 (citing *id.* §§ IX.A.1.c., IX.A.1.d.).

Petitioner also addresses the limitations of claim 17 reciting "cross-coupling inverters between the third and fourth nodes and powering the inverters within the second voltage range for providing a second circuit coupled to the third and fourth nodes which switches the third and fourth nodes to opposite states within the second voltage range in response to switching of the first and second nodes," which Petitioner designates as claim element 17[d]. *Id.* at 57. Similar to its contentions on claim 1, Petitioner asserts that Figure 1 of Schucker and related text disclose all recitations of claim element 17[d]. *Id.* at 57–60 (citing Ex. 2:6–9, 2:12–16, 2:29–43, 2:51–53, 2:58–66, 3:1–3, 3:6–8, 3:33–35, 3:42–47, Fig. 1; Ex. 1004 ¶¶ 107–109).

First, Petitioner asserts that, as discussed in the context of claim elements 1[d], 1[e], and 1[f], Schucker discloses:

> "a second circuit [inverters 46, 48] that switches said third and fourth nodes [47, 49] to opposite states within said second voltage range [1.7 to 5 volts] between third and fourth supply voltages [the output of regulator 32 and node 44] in response to switching of said first and second nodes [15, 17];"
>
> "a first inverter [48] having an input coupled to said fourth node [49], an output coupled to said third node [47] and supply inputs coupled between said third and fourth supply voltages [the output of regulator 32 and node 44];"

> "a second inverter [46] having an input coupled to said third node [47], an output coupled to said fourth node [49] and supply inputs coupled between said third and fourth supply voltages [the output of regulator 32 and node 44]."

Id. at 57–58 (citing *id.* §§ IX.A.1.e., IX.A.1.f., IX.A.1.g.).

Citing the testimony of Dr. Chapman, Petitioner contends that a person of ordinary skill in the art would have understood that Schucker's inverter 46 (the recited "first inverter") and inverter 48 (the recited "second inverter") are "cross-coupling inverters" because of how Schucker describes the inputs and outputs of inverters 46, 48 as being coupled. *Id.* at 58–59 (citing Ex. 1004 ¶ 108). Specifically, Petitioner asserts that Schucker discloses that inverter 46 and inverter 48 are configured in a cross-coupled relationship as follows:

> The source of transistor 34 is coupled to an input of inverter 46 at node 47. The output of *inverter 46 is coupled to an input of inverter 48* at node 49. The source of transistor 36 is also coupled to node 49 and to an input of inverter 52. *The output of inverter 48 is coupled back to node 47 [input to inverter 46]*.

Id. at 58 (citing Ex. 1002, 2:38–43, Fig. 1). Petitioner further explains

> [T]he first and second inverters 46, 48 are described as forming a latch, which a POSITA would have also known as being provided by the cross-coupling relationship of inverters 46, 48. *See, e.g.*, [Ex. 1002,] 2:30–31, 2:37–49, 3:10–12, 3:46–47, 5:34–35, Fig. 1 . . . . The cross-coupled inverters of Schucker are between the third 47 and fourth 49 nodes. As shown in Figure 1 of Schucker, inverter 46 is between the third node 47 (at the input of inverter 46) and the fourth node 49 (at the output of inverter 46). *Id.* at 2:37–39 (Ex. 1002). Likewise, inverter 48 is between the fourth node 49 (at the input of inverter 48) and the third node 47 (at the output of inverter 48). *Id.* at 2:38–43 (Ex. 1002).

Pet. 59.

Petitioner further contends that, for the reasons discussed in the context of claim elements 1[e] and 1[f], inverters 46 and 48 are powered within the second voltage range between third and fourth supply voltages by the supply inputs provided to the inverters 46 and 48. *Id.* at 59 (citing *id.* §§ IX.A.1.f., IX.A.1.g.). Petitioner also asserts that, for the reasons discussed in the context of claim element 1[d], Schucker discloses the claimed "second circuit" that includes inverters 46, 48, such that inverters 46, 48 "provid[e] a second circuit coupled to the third and fourth nodes," as recited in claim 17. *Id.* (citing *id.* § IX.A.1.e.; Ex. 1004 ¶ 108). Thus, Petitioner argues that Schucker discloses "cross-coupling inverters between the third and fourth nodes and powering the inverters within the second voltage range for providing a second circuit coupled to the third and fourth nodes which switches the third and fourth nodes to opposite states within the second voltage range in response to switching of the first and second nodes," as recited in claim 17. *Id.* at 59–60 (citing Ex. 1004 ¶ 109).

In its Response, Patent Owner largely refers to its claim construction and patentability arguments advanced in the context of claim 1 and similarly argues that Schucker does not disclose "coupling" recited in claim 17 under Patent Owner's proposed construction of the term requiring a "push/pull" operation. *See* PO Resp. 27–29, 52–54.

One notable additional argument Patent Owner makes in the context of claim 17 is its assertion that "claim 17's 'coupling' steps . . . are *both performed 'in response to an input signal*.'" *Id.* at 28 (emphasis added). We disagree with Patent Owner's argument because the "coupling" steps recite no such limitations. *See* Ex. 1001, 20:27–30 ("coupling the first node to a third node through a first isolation path which keeps the first node within the

first voltage range and which keeps the third node within a second voltage range"), 20:31–34 ("coupling the second node to a fourth node through a second isolation path which keeps the second node within the first voltage range and which keeps the fourth node within the second voltage range").

For this additional reason and the reasons discussed above in the context of claim 1, we disagree with Patent Owner's proposed claim construction and determine that the claim term "coupling" recited in claim 17 does *not* require the isolation paths to operate in a "push/pull" configuration. Instead, we construe the claim term "coupling" according to its plain meaning and determine that the term "coupling" encompasses potentially conductive paths that can conduct electricity under certain conditions.

Under this claim construction, we determine, based on the complete record and for the reasons explained by Petitioner in the context of claim 1 and additionally with respect to claim 17, that Petitioner has demonstrated sufficiently that Schucker discloses all limitations recited in claim 17. Accordingly, based on the complete record, we determine that Petitioner has demonstrated, by a preponderance of the evidence, that claim 17 is unpatentable under 35 U.S.C. § 102 as anticipated by Schucker.

5. Discussion — Dependent Claim 4

Claim 4 depends from claim 1 and further recites

> wherein said protection layer comprises:
>
> a first N-channel device having a gate receiving said second supply voltage, a source coupled to said first node and a drain;
>
> a first P-channel device having a gate receiving said third supply voltage, a source coupled to said third node and a drain coupled to said drain of said first N-channel device;

> a second N-channel device having a gate receiving said second supply voltage, a source coupled to said second node and a drain; and
>
> a second P-channel device having a gate receiving said third supply voltage, a source coupled to said fourth node and a drain coupled to said drain of said second N-channel device.

Ex. 1001, 17:34–49.

Referencing Figure 1 of Schucker and the accompanying text, Petitioner asserts that N-channel transistor 26 and P-channel transistor 34 of Schucker disclose "a first N-channel device" and "a first P-channel device," respectively, of claim 1's "protection layer," as recited in claim 4. Pet. 46–47 (citing Ex. 1002, 1:66–69, Fig. 1; Ex. 1004 ¶ 89), 48–49 (citing Ex. 1002, 2:9–11, Fig. 1; Ex. 1004 ¶ 92).

As discussed above with respect to claim limitation 1[b], Petitioner has shown sufficiently that transistors 26, 28, 34, and 36, as arranged in Figure 1 of Schucker disclose the "protection layer" recited in claim 1. *Id.* at 28–31. Addressing claim 4, Petitioner contends that N-channel transistor 26 (i.e., the claimed "first N-channel device") has a gate receiving 3.3 volts (i.e., the claimed "second supply voltage") from terminal 54. *Id.* at 47 (citing Ex. 1002, 1:66–69). Petitioner also asserts that the source of Schucker's transistor 26 is coupled to node 15 (i.e., the claimed "first node"). *Id.* (citing Ex. 1002, 1:66–2:1). Petitioner asserts that N-channel transistor 26 also has a drain. *Id.* (citing Ex. 1002, 2:32–33; Ex. 1004 ¶ 90).

Petitioner contends that P-channel transistor 34 of Schucker (i.e., the claimed "first P-channel device") has a gate that receives

1.7 volts (i.e., the claimed "third supply voltage") from regulator circuit 32. *Id.* at 49 (citing Ex. 1002, 2:9–16). Petitioner also argues that the source of transistor 34 is coupled to node 47 (i.e., the claimed "third node"). *Id.* (citing Ex. 1002, 2:37–38). Petitioner asserts that the drain of P-channel transistor 34 is coupled to the drain of N-channel transistor 26 (i.e., the claimed "first N-channel device"). *Id.* at 49–50 (citing Ex. 1002, 2:32–33; Ex. 1004 ¶ 93).

Similarly, Petitioner provides detailed explanations and specific citations to Schucker, describing in detail how N-channel transistor 28 and P-channel transistor 36 of Schucker respectively disclose "a second N-channel device having a gate receiving said second supply voltage, a source coupled to said second node and a drain" and "a second P-channel device having a gate receiving said third supply voltage, a source coupled to said fourth node and a drain coupled to said drain of said second N-channel device," as recited in claim 4. *Id.* at 50–54 (citing Ex. 1002, 1:66–69, 2:1–2, 2:33–34, 2:9–16, 2:39–41, Fig. 1; Ex. 1004 ¶¶ 95–100).

Patent Owner does not respond separately to Petitioner's challenge to claim 4 beyond Patent Owner's arguments advanced with respect to claim 1 discussed above. *See* PO Resp. 35–52.

Based on the complete record presented and for the reasons explained by Petitioner, we determine that Petitioner has demonstrated sufficiently that Schucker discloses all of the limitations additionally recited in dependent claim 4. Accordingly, based on the complete record, we determine that Petitioner has demonstrated, by a

preponderance of the evidence, that claim 17 is unpatentable under 35 U.S.C. § 102 as anticipated by Schucker.[13]

D. Obviousness of Claim 2 Over the Combination of Schucker and Maley or Over Schucker and the Knowledge of a Person of Ordinary Skill in the Art

In these asserted grounds of obviousness, Petitioner contends that claim 2 is unpatentable under § 103(a) over the combined teachings of Schucker and Maley or over the teachings of Schucker combined with the knowledge of a person of ordinary skill in the art. Pet. 60–74; Reply 22–24. Petitioner relies upon the Chapman Declaration (Ex. 1004) and the Chapman Reply Declaration (Ex. 1013) to support its positions. *Id.* In response, Patent Owner asserts that neither Schucker nor Maley teaches "thin gate-oxide devices" recited in claim 2. PO Resp. 29–34, 54–59; Sur-reply 25–27. Patent Owner also asserts that a person of ordinary skill would not have been motivated to modify Schucker or combine Schucker with Maley. PO Resp. 59–61; Sur-reply 27–28. Patent Owner relies on the Ipek Declaration (Ex. 2002) to support its positions. PO Resp. 54–61; Sur-reply 25–28.

Upon review of all of the parties' papers and after considering the evidence of record presented during this proceeding, for the reasons explained below, we determine that Petitioner has demonstrated, by a preponderance of the evidence, that claim 2 is unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Schucker and Maley. We determine, however, that Petitioner has not demonstrated, by a preponderance of the evidence, that claim 2 is unpatentable under 35 U.S.C.

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[13] We also find that Patent Owner has waived any argument directed to the additionally recited claim limitations of claim 4. *See* Paper 9, 5.

§ 103(a) as obvious over Schucker combined with the knowledge of a person of ordinary skill in the art.

1. Relevant Principles of Law

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, so-called secondary considerations.[14] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We analyze the asserted ground based on obviousness with the principles identified above in mind.

2. Overview of Maley (Ex. 1003)

Maley describes an improved gate oxide protected level shifter which has a higher speed of operation. Ex. 1003, code (57). As background, Maley describes that, due to developments in CMOS technologies, the thickness of the transistor gate oxides for forming the CMOS transistor devices is getting increasingly thinner. *Id.* at 2:3–6. According to Maley, in a typical semiconductor process, the gate oxide layer is reduced to a

[14] Patent Owner does not present arguments or evidence of such secondary considerations in its Preliminary Response. Therefore, at this stage of the proceeding, secondary considerations do not constitute part of our analysis.

thickness of approximately 60 Å (angstroms) or less, and is likely to break down if a voltage of 2.4 to 2.5 volts or higher is applied across the gate. *Id.* at 2:6–10.

Maley describes that, in a level shifter circuit, P-channel transistors may be subject to a voltage difference of 3.3 volts across their drains and gates. *Id.* at 2:14–16. Thus, if the gate oxide thickness is 60 Å or less, the gate oxide in the transistors will experience a breakdown and the level shifter circuit will fail. *Id.* at 2:16–18. Maley describes that, to overcome this problem, prior art gate oxide protected level shifters used an arrangement of PMOS and NMOS transistors to limit the voltage difference at a gate oxide to be below a breakdown voltage. *Id.* at 2:18–23.

Figure 2 of Maley is reproduced below.

Fig. 2
Prior Art

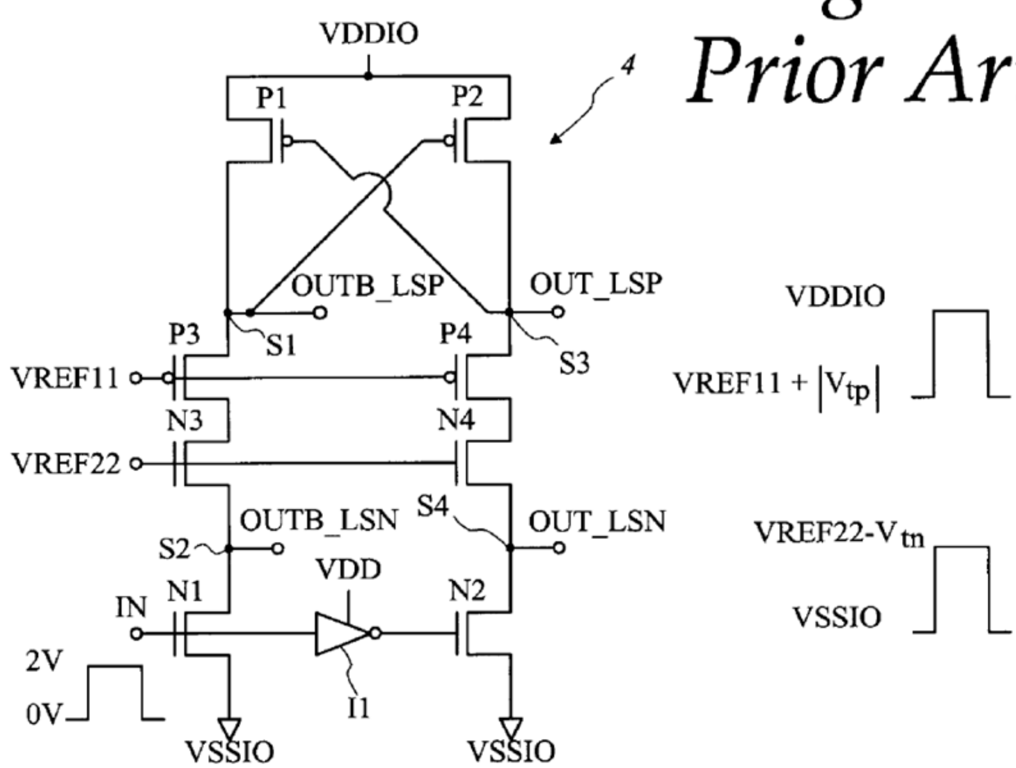

Figure 2 shows a schematic circuit diagram of a prior art gate oxide protected level shifter. *Id.* at 2:24–25.

As shown in Figure 2, level shifter 4 comprises a pair of cross-coupled P-channel MOS transistors P1 and P2, a pair of input N-channel transistors N1 and N2, and a CMOS inverter 11. *Id.* at 2:25–27. Level shifter 4 further includes PMOS transistors P3 and P4 and NMOS transistors N3 and N4, which function to prevent the gate oxide voltage of any transistor from exceeding a breakdown voltage. *Id.* at 2:30–34.

3. *Claim Construction — "thin gate-oxide devices"*

The parties' dispute in this proceeding over the patentability of claim 2 centers on whether Schucker or Maley teaches "thin gate-oxide devices" recited in claim 2. In the Petition, Petitioner points to the statement in the '588 patent that "[a]s used herein, the term 'thin-gate' refers to thin gate-oxide devices that are suitable for the lower voltage ranges but that would break down if exposed to higher voltage levels" (Pet. 62 (citing Ex. 1001, 1:31–36)) and asserts that a person of ordinary skill in the art would have understood that Schucker teaches "thin gate-oxide devices" because "the MOS devices in Schucker are described as not being able to withstand the full voltage range of the level shifter because of the gate oxide layer" (*id.*).

In its Response, Patent Owner asserts that a person of ordinary skill in the art would not interpret the claim term "thin gate-oxide devices" to include "Schucker's 3.3V-range devices" because the '588 patent defines such devices as "thick-gate" devices. PO Resp. 29.

We determine that the sentence from the '588 patent Petitioner relies on—i.e., "[a]s used herein, the term 'thin-gate' refers to thin gate-oxide

devices that are suitable for the lower voltage ranges but that would break down if exposed to higher voltage levels" (Ex. 1001, 1:33–35)—provides a lexicographic definition for the term "thin gate-oxide devices" because the phrases "[a]s used herein" and "the term 'thin-gate' refers to" indicate that the patentee was acting his own lexicographer and "clearly set forth a definition" of the term in the Specification. *See Edwards Lifesciences LLC v. Cook Inc.*, 582 F.3d 1322, 1329 (Fed. Cir. 2009) ("[W]e will adopt a definition that is different from the ordinary meaning when the patentee acted as his own lexicographer and *clearly set forth a definition* of the disputed claim term in either the specification or prosecution history." (emphasis added) (internal quotation marks omitted) (citation omitted)). In addition, we find the lexicographic definition, "thin gate-oxide devices that are suitable for the lower voltage ranges but that would break down if exposed to higher voltage levels," shows that the patentee "clearly, deliberately, and precisely defined the term" in the Specification. *See Sinorgchem Co., Shandong v. Int'l Trade Comm'n*, 511 F.3d 1132, 1136 (Fed. Cir. 2007).

Patent Owner argues that claim 2 recites "thin gate-oxide devices," not "thin-gate." Sur-reply 26. We do not find the differences in the precise wording of these terms to be a meaningful distinction in the context of the '588 patent because the Specification repeatedly uses terms "thin gate-oxide device" and "thin-gate device" interchangeably. *See, e.g.*, Ex. 1001, 4:26–36 (stating

> The transistors 101 and 107 are smaller *thin-gate* devices and the inverters 103 and 104 are implemented with *thin-gate* devices. *Thin-gate* devices are relatively fast but unable to withstand higher voltage levels, such as greater than 1.5 Volts (V). The

> voltage difference or range of VDDL and GNDL is sufficiently large to enable switching of the devices and yet sufficiently small to protect each *thin-gate* device of the circuit 102 from being exposed to excessive voltage levels. The transistors 113, 115, 117 and 119 of the protection layer 104 are also *thin-gate* devices.

(emphases added)). *Cf. Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1345 (Fed. Cir. 2016) ("[W]hen examining the written description for support for the claimed invention, we have held that the exact terms appearing in the claim need not be used *in haec verba*." (internal quotation marks omitted) (citation omitted)). We note that, as indicated above, the Specification also repeatedly describes that the "thin-gate" and "thin gate-oxide" devices are transistors.

As set forth above, the lexicographic definition of the disputed term does not state any specific voltage ranges for the "lower voltage ranges" or the "higher voltage levels." *See* Ex. 1001, 1:33–35. Nonetheless, Patent Owner contends that "devices that are capable of being exposed to a voltage range between 0V and 3.3–3.6V" are not "thin gate-oxide devices" recited in claim 2, but instead are "thick-gate" devices, because the Specification defines "thick-gate" as "devices capable of being exposed to a 0V–3.3V range." PO Resp. 30–31 (citing Ex. 1001, 1:35–40). The portion of the Specification cited by Patent Owner is reproduced below:

> The term "thick-gate" refers to thick gate-oxide devices that are capable of being exposed to the higher voltage ranges. In the more *specific embodiments* illustrated herein, the lower voltage range is up to 1.2 V whereas the higher or full voltage range is between ground (0 V) and 3.3–3.6 V.

Ex. 1001, 1:35–40 (emphasis added). These passages show that the '588 patent also provides an express definition for a "thick-gate" without stating

any specific voltage ranges for the term. Thus, the description of the "specific embodiments" in the Specification Patent Owner cites does not change the lexicographic definitions for "thick-gate" or "thin gate-oxide devices" to impose any specific voltage requirements. *See Martek Biosciences Corp. v. Nutrinova, Inc.*, 579 F.3d 1363, 1380 (Fed. Cir. 2009) ("When a patentee explicitly defines a claim term in the patent specification, the patentee's definition controls.").

We note that the '588 patent states that "[i]t is understood, however, that the *particular voltage levels and values are arbitrary* and may change over time, such that what is now called 'thin' may be considered 'thick' by tomorrow's standards." Ex. 1001, 1:40–44 (emphasis added). More importantly, the '588 patent states that "*[t]he present invention transcends* the particular voltage levels and ranges in that the configuration allows the lower voltage or thin-gate devices to be used in a buffer that switches higher voltage levels which would otherwise require higher voltage devices." *Id.* at 1:44–48. These passages about "the present invention" indicate that the claimed invention is not restricted to any voltage ranges and that the subject matter disclosed in the '588 patent is about the general approach of allowing the lower voltage or thin-gate devices to be used in a level shifter circuit that switches higher voltage levels, which would otherwise require higher voltage devices.

The description of exemplary embodiments in the '588 patent is also consistent with this understanding. For example, the Specification describes as follows:

> The transistors 101 and 107 are smaller thin-gate devices and the inverters 103 and 104 are implemented with thin-gate devices. Thin-gate devices are relatively fast but unable to withstand

> higher voltage levels, *such as* greater than 1.5 Volts (V). The voltage difference or range of VDDL and GNDL is sufficiently large to enable switching of the devices and yet sufficiently small to protect each thin-gate device of the circuit 102 from being exposed to excessive voltage levels. The transistors 113, 115, 117 and 119 of the protection layer 104 are also thin-gate devices. The transistors 113 and 115 receive VDDL at their gates thereby preventing the voltage of the lower circuit 102 from exceeding VDDL. The transistors 117 and 119 receive GNDH at their gates thereby preventing the voltage of the upper circuit 106 from falling below GNDH. Likewise, the upper circuit 106 is implemented with thin-gate devices and the voltage range of VDDH and GNDH is sufficiently large to enable switching of the thin-gate devices and yet sufficiently small to protect each thin-gate device from being exposed to excessive voltage levels. Yet VDDH is greater than VDDL and GNDH is greater than GNDL (for the up-shift configuration), so that the effective switching voltage level of the up-shift circuit 100 is shifted to a higher level. The voltage level across the entire up-shift circuit 100, or VDDH to GNDL, can exceed the allowable maximum voltage of any given thin-gate device since none of the devices are exposed to the entire voltage range.

Ex. 1001, 4:27–54 (emphasis added). The use of the phrase "such as" when referring to a specific voltage of 1.5 volts in the passages reproduced above, as well as the use of abstract symbolic names VDDL, VDDH, GNDL, and GNDH to describe the voltages applied to the thin gate-oxide devices, is consistent with the '588 patent's general statements about the claimed invention discussed above, such as "[t]he present invention transcends the particular voltage levels and ranges" and "the particular voltage levels and values are arbitrary."

Patent Owner further asserts that claim 2 recites "thin gate-oxide devices which are suitable for either of said first and second voltage ranges but which are not suitable to a full voltage range between said first and

fourth supply voltages," and, therefore, adopting the definition of "thin gate-oxide devices" from the Specification would render the recited claim language "suitable for either of said first and second voltage ranges but which are not suitable to a full voltage range between said first and fourth supply voltages" in claim 2 superfluous. PO Resp. 33–34. We are not persuaded by Patent Owner's argument because all that means is that the claim language of claim 2 tracks the lexicographical definition of the term "thin gate-oxide devices" provided in the Specification. Although we recognize that "narrowing a term by a superfluous limitation when the claims explicitly recited the narrowing limitation" is disfavored, *see Digital-Vending Servs. Int'l, LLC v. Univ. of Phoenix, Inc.*, 672 F.3d 1270, 1274–75 (Fed. Cir. 2012), we are also mindful that "no canon of [claim] construction is absolute in its application," *ERBE Elektromedizin GmbH v. Canady Tech. LLC*, 629 F.3d 1278, 1286 (Fed. Cir. 2010). More importantly, in our view, what we have in this case is *not* "narrowing a term by a superfluous limitation when the claims explicitly recited the narrowing limitation," but, rather, similarity between the claim language and the definition provided in the Specification.

Based on the complete record and the foregoing discussion, we construe the term "thin gate-oxide devices" according to the lexicographic definition provided in the Specification to mean "gate-oxide devices that are suitable for the lower voltage ranges but that would break down if exposed to higher voltage levels." Ex. 1001, 1:33–35. In particular, we determine that the recited "thin gate-oxide devices" are not restricted to any specific voltage ranges.

4. Discussion — Obviousness over Schucker and Maley

Claim 2 depends from claim 1 and additionally recites "wherein said first and second circuits and said protection layer each comprise thin gate-oxide devices which are suitable for either of said first and second voltage ranges but which are not suitable to a full voltage range between said first and fourth supply voltages." Ex. 1001, 17:12–17. Petitioner asserts that, according to the '588 patent, a thin gate-oxide device is a device, such as a transistor, that would break down if exposed to higher voltage levels, e.g., a voltage range including the lowest and highest voltages in a level shifter. Pet. 62 (citing Ex. 1001, 1:31–36; Ex. 1004 ¶ 112), 69 (citing Ex. 1004 ¶ 124).

Referencing Figure 1 of Schucker, Petitioner contends that Schucker teaches to use thin gate-oxide devices for transistors 26, 28, 34, and 36, i.e., the claimed "protection layer." *Id.* at 64 (citing Ex. 1002, 3:60–64), 69 (citing Ex. 1002, 2:17–31, 5:49–53), 72. Petitioner does not identify, however, any express teaching in Schucker for using thin gate-oxide devices for inverters 14 and 16 (i.e., the claimed "first circuit) and inverters 46 and 48 (i.e., the claimed "second circuit"). To address this deficiency, Petitioner asserts that Maley teaches using thin gate-oxide devices for inverters. *Id.* at 71–72 (citing Ex. 1003, 1:27–30, 1:50–54, 2:3–35, 4:50–51, 5:16–23; Ex. 1004 ¶ 128).

Petitioner argues that Maley discloses that inverters I1 and I101 depicted in Maley's Figures 2 and 3 are "CMOS devices" (*id.* at 70–71 (citing Ex. 1003, 1:27–30, 2:29, 4:50–51, Figs. 2, 3; Ex. 1004 ¶ 127)) and that a person of ordinary skill in the art would have understood that the CMOS inverters are made of N-channel and P-channel devices. *Id.* at 71

(citing Ex. 1003, 1:50–54). Petitioner asserts that a person of ordinary skill in the art would have understood that the N-channel and P-channel transistors in Maley's inverters are thin gate-oxide devices because Maley teaches that *all* transistors in the level shifters of Figures 2 and 3 are thin gate-oxide devices. *Id.* at 71–72 (citing Ex. 1003, 2:3–35, 5:16–23).

Petitioner contends that a person of ordinary skill in the art reading Schucker would have looked to Maley for its teachings because Maley and Schucker are both directed to level shifters having a first circuit, a second circuit, and a protection layer (*id.* at 72 (citing Ex. 1002, code (57), Fig. 1; Ex. 1003, Figs. 2, 3)) and both are directed to protecting their thin gate-oxide devices using protection layers (*id.* (citing Ex. 1002, 2:17–31, 2:61–66, 3:38–40, 5:49–53, Fig. 1; Ex. 1003, 2:3–54, 3:31–34, 4:38–47, 5:16–29, Figs. 2, 3; Ex. 1004 ¶ 129)).

Petitioner asserts that a person of ordinary skill in the art would have been motivated to combine the teachings of Schucker and Maley in the manner proposed by Petitioner (i.e., combining the thin gate-oxide transistors 26, 28, 34, and 36 of Schucker with Maley's CMOS inverters made of thin gate-oxide transistors) because a person of ordinary skill in the art would have been motivated to use only thin gate-oxide devices in the level shifter due to the known manufacturing complexities of mixing thin and thick gate-oxide devices. *Id.* at 73–74 (citing Ex. 1007, 1:26–29, 1:38–40, 2:36–40; Ex. 1008, 3:25–35; Ex. 1004 ¶ 130). Petitioner's declarant, Dr. Chapman, discusses the rationale to combine Schucker and Maley so as to use only thin gate-oxide devices in the level shifter, citing evidence in support of his testimony. Ex. 1004 ¶¶ 130, 117–119 (citing Ex. 1007 ("Hunt"), Ex. 1008 ("Mitarashi")).

As discussed above, Patent Owner asserts that Schucker does not teach the recited "thin gate-oxide devices" because "Schucker's 3.3V range devices are among the devices that the '588 Patent dubs 'thick-gate.'" PO Resp. 56 (citing Ex. 1001, 1:36–41). Patent Owner similarly argues that Maley does not teach the recited "thin gate-oxide devices" because "Maley's transistors have a maximum voltage range of 2.5V, over twice the range of the 'thin gate-oxide devices' taught in the '588 Patent." *Id.* at 58 (citing Ex. 1003, 5:16–23; Pet. 70). We disagree with Patent Owner's arguments because they are predicated on Patent Owner's proposed claim construction of "thin gate-oxide devices," which we do not adopt.

Patent Owner further contends that a person of ordinary skill in the art would not have been motivated to modify Schucker "to use only thin gate-oxide devices" in the proposed combination because Schucker's regulator 32 would be exposed to Schucker's full voltage range, and, therefore, cannot include "thin gate-oxide devices." PO Resp. 59–60 (citing Ex. 2002 ¶ 97).

We are not persuaded by Patent Owner's argument because Petitioner does *not* propose to "use only thin gate-oxide devices" for *all* elements of Schucker, including regulator 32. Rather, Petitioner asserts that the proposed combination of Schucker and Maley teaches the recited "first and second circuits" and "protection layer" of claim 2, all of which comprise "thin gate-oxide devices." *See* Pet. 68–74.

Based on the complete record and the foregoing discussion of the arguments and evidence presented by Petitioner and Patent Owner, we determine, for the reasons explained by Petitioner, Petitioner has shown sufficiently that the combination of Schucker and Maley teaches or renders obvious all additional limitations recited in claim 2. We also find that

Petitioner has provided sufficient articulated reasoning with rational underpinning why a person of ordinary skill in the art would have been motivated to combine Schucker and Maley as proposed by Petitioner.

Accordingly, upon considering the complete record, we determine that Petitioner has demonstrated, by a preponderance of the evidence, the subject matter of claim 2 would have been obvious under 35 U.S.C. § 103(a) over the combination of Schucker and Maley.

5. Discussion — Obviousness Over Schucker and the Knowledge of a Person of Ordinary Skill in the Art

In the alternative, Petitioner contends that claim 2 is unpatentable under § 103(a) over the teachings of Schucker combined with the knowledge of a person of ordinary skill in the art. Pet. 60–67. In our Decision on Institution, we questioned whether Petitioner was "using the knowledge of a person of ordinary skill in the art to supply any limitations *missing* from Schucker or to supply the *motivation to modify* Schucker, or both." Dec. on Inst. 37 (citing *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, 1363 (Fed. Cir. 2016) ("In cases in which 'common sense' [or general knowledge in the art] is used to supply a *missing* limitation, *as distinct from a motivation to combine* . . . our search for a reasoned basis for resort to common sense must be searching." (emphases added))). Based on the record presented at the preliminary stage, we found that Petitioner did not explain adequately how, apart from Schucker itself, one of ordinary skill would have known about the limitation missing from Schucker, e.g., inverters made of thin gate-oxide devices. *Id.* at 37–38 (citing *Randall Mfg. v. Rea*, 733 F.3d 1355, 1362 (Fed. Cir. 2013) ("In recognizing the role of common knowledge and common sense, we have emphasized the importance of a factual foundation to support

a party's claim about *what one of ordinary skill in the relevant art would have known*." (emphasis added))). Thus, based on the record presented at the preliminary stage, we found that the nature of Petitioner's obviousness argument based on Schucker combined with the knowledge of a person of ordinary skill in the art was not sufficiently clear to support a finding of reasonable likelihood for this asserted ground.

In its Reply, Petitioner does not adequately address our concerns, but instead only addresses its asserted ground based on Schucker and Maley. *See* Reply 22–25. Accordingly, based on the complete records, we determine that Petitioner has *not* demonstrated, by a preponderance of the evidence, the subject matter of claim 2 would have been obvious under 35 U.S.C. § 103(a) over the combination of Schucker and the knowledge of a person of ordinary skill in the art.

E. Patent Owner's Constitutionality Arguments

Patent Owner contends cancelling claims in this proceeding would contravene the Appointments Clause of the U.S. Constitution as *inter partes* review is unconstitutional when conducted by administrative patent judges not nominated by the President and confirmed by the Senate. PO Resp. 61. Patent Owner also argues that "[t]he Constitution also forbids retroactive application of IPR to the Patent, which was filed before the Leahy-Smith America Invents Act ('AIA'), Pub. L. No. 112-29, 125 Stat. 284 (2011) was enacted and issued before it took effect." *Id.* at 61–62.

We decline to consider these constitutional challenges as they have been addressed by the Federal Circuit in *Celgene Corp. v. Peter*, 931 F.3d

1342 (Fed. Cir. 2019) and *Arthrex, Inc. v. Smith & Nephew, Inc.*, 941 F.3d 1320 (Fed. Cir. 2019).

IV. CONCLUSION[15]

For the foregoing reasons, we conclude that Petitioner has met its burden of proof, by a preponderance of the evidence, in showing that claims 1, 2, 4, and 17 of the ’588 patent are unpatentable.

In summary:

Claim(s)	**35 U.S.C. §**	**Reference(s)/ Basis**	**Claim(s) Shown Unpatentable**	**Claim(s) Not Shown Unpatentable**
1, 4, 17	102	Schucker	1, 4, 17	
2	103(a)	Schucker and Maley	2	
2	103(a)	Schucker and the knowledge of a person of ordinary skill in the art		2
Overall Outcome			1, 2, 4, 17	

[15] Should Patent Owner wish to pursue amendment of the challenged claim in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1, 2, 4, and 17 of the '588 patent are determined to be unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, a party to the proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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EXHIBIT 9

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Paper 44
Entered: December 2, 2019

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION,
Petitioner,

v.

VLSI TECHNOLOGY LLC,
Patent Owner.

IPR2018-01105
Patent 7,709,303 B2

Before BART A. GERSTENBLITH, MINN CHUNG, and KIMBERLY McGRAW, *Administrative Patent Judges.*

McGRAW, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

In this *inter partes* review, instituted pursuant to 35 U.S.C. § 314, Intel Corporation ("Petitioner") challenges claims 1–11, 13–16, and 18 of U.S. Patent No. 7,709,303 B2 (Ex. 1001, "the '303 patent"), owned by VLSI Technology LLC ("Patent Owner"). This Final Written Decision is entered

pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons discussed below, Petitioner has shown by a preponderance of the evidence that claims 1–11, 13–16, and 18 of the ’303 patent are unpatentable.

A. Procedural History

Petitioner filed a Petition for *inter partes* review of claims 1–11, 13–16, and 18 of the ’303 patent. Paper 3 (“Pet.”). Patent Owner filed a Preliminary Response. Paper 13 (“Prelim. Resp.”). Applying the standard set forth in 35 U.S.C. § 314(a), which requires demonstration of a reasonable likelihood that Petitioner would prevail with respect to at least one challenged claim, we instituted an *inter partes* review of all challenged claims on all grounds asserted in the Petition. Paper 17 (“Dec. Inst.”).

Following institution, Patent Owner filed a Patent Owner Response (Paper 24, “PO Resp.”), to which Petitioner filed a Reply (Paper 33, “Pet. Reply”). Patent Owner then filed an authorized Sur-Reply (Paper 35, “Sur-Reply”). An oral hearing was held on January 15, 2019, and a copy of the hearing transcript has been entered into the record. Paper 43 (“Tr.”).

B. The ’303 Patent

The ’303 patent is directed to processes for forming electronic devices, and more particularly, to devices that include fin-type transistor structures. Ex. 1001, 1:21–23. The ’303 patent states that the process “include[s] forming a semiconductor fin of a first height for a fin-type structure and removing a portion of the semiconductor fin such that the semiconductor fin is shortened to a second height.” *Id.* at [57]. The ’303 patent further states that in certain embodiments, “a second semiconductor fin can be formed, each of the first and the second

semiconductor fins having a different height representing a channel width." *Id.*

A specific embodiment of a process flow is shown in Figures 1 through 8. *Id.* at 1:45–46. Figure 3, reproduced below, illustrates a cross-sectional view of workpiece 10 during processing after removal of exposed portions of layer 18. *Id.* at 2:56–58.

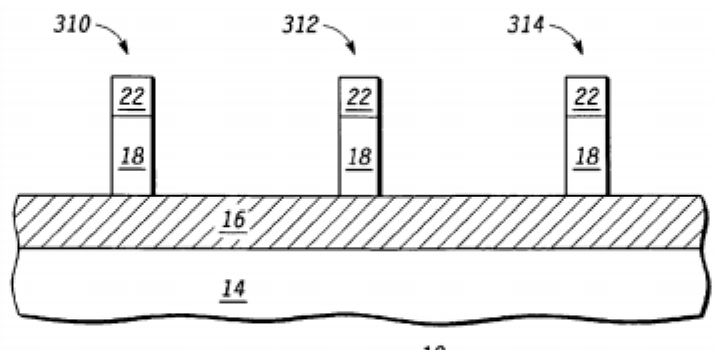

FIG. 3

As shown in Figure 3 above, a portion of layer 22 overlies layer 18 to protect layer 18 during a removal process. *See id.* at 2:60–65. The '303 patent explains that a "portion of layer 18 underlying remaining portions of layer 22 can form a semiconductor fin. The 'height' of a semiconductor fin can have substantially the same value as the 'thickness' of the previously formed layer 18." *Id.* at 2:66–3:3; *see also id.* at 6:21–24 (stating "the term 'height' is intended to mean the physical dimension of distance from the base to the top of a structure in a direction substantially perpendicular to the primary surface"). "In the illustrated embodiment, a semiconductor fin at location 312 can be associated with a FinFET [i.e., a fin field effect transistor] that is a PMOS [i.e., p-channel metal-oxide-semiconductor] transistor, while semiconductor fins at locations 310 and 314

can be associated with that [sic] are NMOS [i.e., n-channel metal-oxide-semiconductor] transistors." *Id.* at 3:6–9.

Figure 4, reproduced below, illustrates work piece 10 at a further processing step.

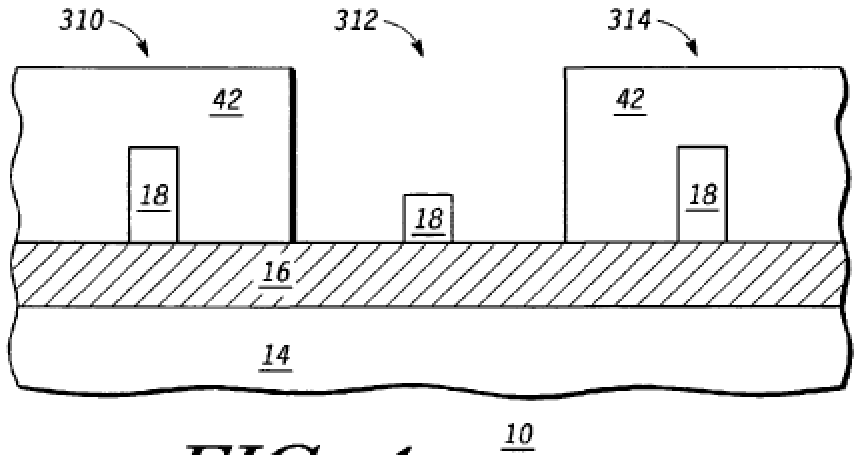

FIG. 4

Figure 4 of the '303 patent illustrates a cross-sectional view of workpiece 10 after a formation of patterned layer 42 and partial removal of a portion of semiconductor layer 18 at location 312. *Id.* at 3:26–29. The '303 patent explains that a patterned layer can overlie locations 310 and 314 to protect them during processing at location 312. *Id.* at 3:29–31. The exposed portions of semiconductor layer 18 can then be partially removed using conventional or proprietary process. *Id.* at 3:33–35.

Figure 5, shown below, shows a cross-sectional view of workpiece 10 at a further processing step.

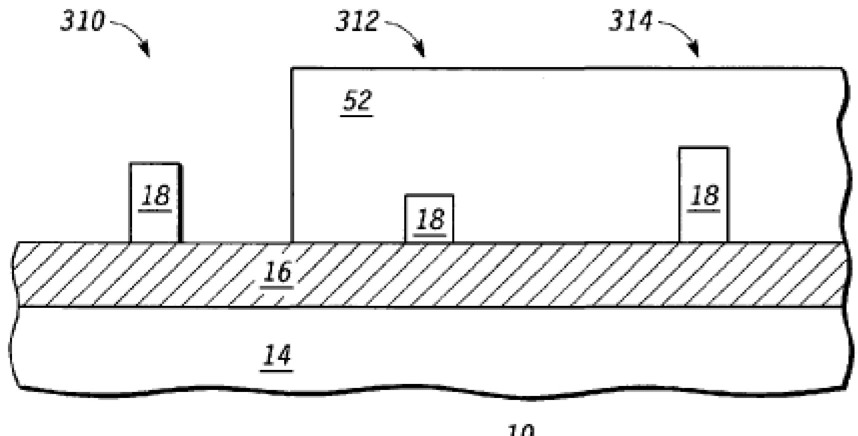

FIG. 5

Figure 5, above, illustrates a workpiece 10 after formation of patterned layer 52 and partial removal of the portion of semiconductor layer 18 at location 310. *Id.* at 3:47–50. Patterned layer 52 can be formed over workpiece 10 to overlie locations 312 and 314 to protect them during processing at location 310. *Id.* at 3:50–52. Exposed portions of semiconductor layer 18 can then be partially removed using conventional or proprietary process. *Id.* at 3:52–54. For example, in one embodiment, the semiconductor fin at location 310 can be shortened by as much as approximately 75% of the original height. *Id.* at 3:54–56. In the illustrated embodiment, the remaining portion of semiconductor layer 18 at location 310 and location 314 can comprise the channel regions for n-channel and FinFET transistors. *Id.* at 3:59–62. In the illustrated embodiment, remaining portions of the semiconductor layer 18 at locations 310, 312, and 314 can each form a semiconductor fin having a different height. *Id.* at 3:66–4:1.

Figure 6, reproduced below, illustrates a cross-sectional view of the workpiece of Figure 5 after formation of layers 64, 66, and 68 at locations 310, 312, and 314, respectively. *Id.* at 4:8–10.

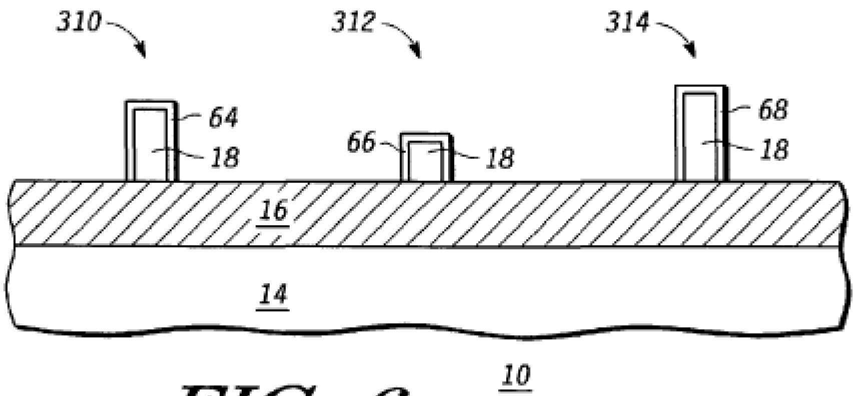

FIG. 6

Layer 64 of Figure 6, shown above, can serve as a gate dielectric and can include, *inter alia*, a film of silicon dioxide, silicon nitride, a high dielectric constant material, or any combination thereof. *See id.* at 4:10–14. Dielectric layer 64 may be thermally grown using an oxidizing or nitridizing ambient, or deposited using a conventional or proprietary chemical vapor ("CVD") technique, physical vapor deposition ("PVD") technique, or a combination thereof. *Id.* at 4:26–31.

C. Illustrative Claims

Claims 1, 13, and 18 are the challenged independent claims. Claims 1 and 18 are representative and reproduced below with bracketing and formatting added.

> 1. A process for forming an electronic device comprising:
>
> [a] forming a first semiconductor fin for a first fintype transistor structure over a support layer of a substrate, wherein, the first semiconductor fin has a first height; and
>
> [b] removing a portion of the first semiconductor fin to provide the first semiconductor fin with a second height, wherein the second height is smaller than the first height.

Id. at 13:65–14:32.

> 18. A process for forming an electronic device, comprising:
>
> [a] forming a first semiconductor fin for a first fin-type transistor structure, the first semiconductor fin having a first height;
>
> [b] forming a second semiconductor fin for a second fin-type transistor structure, the second semiconductor fin having the first height;
>
> [c] removing a portion of the second semiconductor fin to provide the second semiconductor fin with a second height smaller than the first height; and
>
> [d] forming a first gate electrode overlying the first semiconductor fin wherein a first channel region of the first semiconductor fin has a first channel width approximately equal to twice the first height; and
>
> [e] forming a second gate electrode overlying the second semiconductor fin wherein a second channel region within the second semiconductor fin has a second channel width approximately equal to twice the second height.

Id. at 10:20–37.

D. Real Parties in Interest

Petitioner identifies Intel Corporation as the real party in interest. Pet. 1. Patent Owner identifies VLSI Technology LLC and CF VLSI Holding LLC as real parties in interest. Paper 22, 1 (Patent Owner's Updated Mandatory Notices).

E. Related Matters

Petitioner states Patent Owner has asserted claims 4–8 of the '303 patent in *VLSI Technology LLC v. Intel Corp.*, No. 1:17-cv-05671-JCS (N.D. Cal.). Pet. 1; *see* Paper 22, 1. Petitioner also states that it is filing

separate *inter partes* review petitions for claims 1–11, 13–16, and 18 of the '303 patent. Pet. 2. To our knowledge, no such petitions have been filed.

F. Evidence

Petitioner relies upon the following references:

Pub. No. US 2005/0029603 A1, published Feb. 10, 2005 (Ex. 1003, "Yu").

Pub. No. US 2005/0148137 A1, published July 7, 2005 (Ex. 1004, "Brask").

Pub. No. US 2004/0036127 A1, published Feb. 26, 2004 (Ex. 1005, "Chau").

In addition, Petitioner relies on a declaration by Dr. John Bravman (Ex. 1002). Dr. Bravman's deposition transcript also is of record. Ex. 2006.

Patent Owner relies on the declaration of Dean P. Neikirk, Ph.D. (Ex. 2004). Dr. Neikirk's deposition transcript also is of record. Ex. 1018.

G. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–11, 13–16, and 18 would have been unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)
1–6, 8–11, and 18	102[1]	Yu
7	103	Yu, Brask
1–7, 9–11, 13, 14, 16	102	Chau
2, 5, 8, 11, 15	§ 103	Chau, Yu

[1] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA"), amended 35 U.S.C. §§ 102 and 103. Because the '303 patent has an effective filing date before September 16, 2012, the effective date of the applicable AIA amendments, we refer to the pre-AIA versions of §§ 102 and 103.

II. ANALYSIS

A. Legal Standards

To prevail on its challenge to Patent Owner's claims, Petitioner must demonstrate by a preponderance of the evidence that the claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). A claim is unpatentable as anticipated under 35 U.S.C. § 102 only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co.*, 814 F.2d 628, 631 (Fed. Cir. 1987). A claim is unpatentable for obviousness under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are "such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) when in evidence, objective indicia of non-obviousness (i.e., secondary considerations).[2] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

In determining whether an invention would have been obvious at the time it was made, we consider the level of ordinary skill in the pertinent art at the time of the invention. *Graham*, 383 U.S. at 17. Petitioner contends a person of ordinary skill in the art at the time of the alleged invention of the

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[2] The parties do not address secondary considerations, which therefore do not constitute part of our analysis.

’303 patent (a “POSITA”) would have had at least an M.S. degree in electrical engineering or materials science (or equivalent experience) and would have had two or three years of experience with integrated current processing, manufacturing, and structures. Pet. 20 (citing Ex. 1002 ¶ 61). Patent Owner does not articulate a level of skill for a POSITA. *See generally* PO Resp.

We adopt Petitioner’s articulation of the level of ordinary skill in the art, except that we delete the qualifier “at least” to eliminate vagueness as to the appropriate level of education. The qualifier expands the range without an upper bound, i.e., encompassing a Ph.D. degree and beyond, and thus precludes a meaningful indication of the level of ordinary skill in the art. We find Petitioner’s articulation of the level of skill in the art, as modified, is commensurate with the level of ordinary skill as reflected in the prior art.

C. Claim Construction

In an *inter partes* review filed before November 13, 2018, we construe claim terms in an unexpired patent according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b) (2017);[3] *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard as the claim interpretation standard to be applied in *inter partes* reviews). Consistent with the broadest reasonable construction, claim terms are presumed to have their ordinary and customary

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[3] The 2018 amendment to this rule does not apply here because the Petition was filed before November 13, 2018. *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (amending 37 C.F.R. § 42.100(b) effective Nov. 13, 2018).

meaning as understood by a person of ordinary skill in the art in the context of the entire patent disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). An inventor may provide a meaning for a term that is different from its ordinary meaning by defining the term in the specification with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). Thus, we look to the specification to see if it provides a definition for claim terms, but otherwise apply the broadest reasonable interpretation in light of the specification. *In re ICON Health and Fitness, Inc.*, 496 F.3d 1374, 1379 (Fed. Cir. 2007).

We construe the claim terms below in accordance with these principles. To the extent necessary, we consider the meaning of other claim language in the context of our unpatentability analysis.

1. Semiconductor Fin "Height"

The term "height" is recited in independent claims 1 and 18 and in dependent claims 8, 11, 12, and 19. For example, claim 1, element [a] states that "the first semiconductor fin has a first height." Claim 1, element [b] requires removing a portion of the first semiconductor fin "to provide the first semiconductor fin with a second height, wherein the second height is smaller than the first height."

In our Decision to Institute, we determined the broadest reasonable construction of "height" is the "physical dimension of distance from the base to the top of a structure in a direction substantially perpendicular to a surface from which a transistor structure is subsequently formed." Dec. Inst. 11. We based this construction on the express language of the Specification, which (1) defines "height" to "mean the physical dimension of the distance from the base to the top of a structure in a direction substantially

perpendicular to *the primary surface*" (Ex. 1001, 6:21–24) and (2) defines "primary surface" to "mean a surface from which a transistor structure is subsequently formed" (*id.* at 5:61–63). In other words, the '303 patent defines "height" to mean the "physical dimension of distance from the base to the top of a structure in a direction substantially perpendicular to a primary surface," wherein the primary surface is a "surface from which a transistor structure is subsequently formed." *Id.* at 5:61–63, 6:21–24. The parties do not dispute our construction. *See generally* PO Resp.; Reply; Sur-Reply. Considering all of the evidence of record, we maintain this construction.

2. "Removing a Portion" of a "Semiconductor Fin"

Each of independent claims 1, 13, and 18 recites "removing a portion of" a "semiconductor fin." *See* claim 1 ("removing a portion of the first semiconductor fin to provide the first semiconductor fin with a second height"), claim 13 ("removing a portion of the first semiconductor fin to provide a first fin-type transistor structure a first channel region having a first channel width"), claim 18 ("removing a portion of the second semiconductor fin to provide the second semiconductor fin with a second height smaller than the first height"). Similar limitations are also recited in dependent claims 2, 6, 8, 11, 12, and 19. *See, e.g.*, claim 2 ("forming a second semiconductor fin . . . prior to removing the portion of the first semiconductor fin").

Prior to institution, neither party argued the phrase "removing a portion of" a "semiconductor fin" required an explicit construction. The parties, however, disputed whether Chau's thermal oxidation process, which Petitioner asserts converts some of the silicon atoms in Chau's

semiconductor fin to silicon dioxide, satisfies the removing limitations. *See, e.g.*, Pet. 49–51; Prelim. Resp. 26–33. In our Decision to Institute, we stated Petitioner did not persuasively show that Chau's thermal oxidation process discloses removing a portion of a semiconductor fin because Chau's process does not remove silicon atoms from the fin, but rather, adds oxygen. *See* Dec. Inst. 21–22.

During the proceeding, Petitioner challenges our understanding of the phrase, asserting the phrase requires removal of a portion of the *semiconductor* fin, not a portion of the *silicon atoms*. Petitioner contends that because silicon dioxide is not a semiconducting material, Chau's conversion of a semiconducting material (silicon) to a non-semiconducting material (silicon dioxide) results in the removal of a portion of the semiconductor, as required by the claims. *See* Reply 10–17.

Patent Owner disagrees with Petitioner, contending "removing a portion of the fin so as to reduce its height involves taking away a portion of the fin to reduce the height of the remaining structure and . . . that creating a gate dielectric layer through silicon dioxide [as taught by Chau] does not constitute removing a portion of the fin as claimed." PO Resp. 51; *see also id.* at 8–12, 45–51; Sur-Reply 8–17.

Thus, to resolve the parties' dispute, it is necessary to construe the phrase "removing a portion of" a "semiconductor fin" to the extent necessary to determine whether, under a broadest reasonable interpretation consistent with the Specification, the phrase "removing a portion of" a "semiconductor fin" requires the physical elimination of material from the semiconductor fin or whether the phrase can encompass the removal of the

semiconducting portion of a fin by the conversion of a portion of the fin semiconducting material into a non-semiconducting material.

Upon consideration of the full record, we determine that the broadest reasonable interpretation of "removing a portion" of a "semiconductor fin" consistent with the Specification means "eliminating a portion of the semiconductor fin." Eliminating a portion of the semiconductor fin can include converting a portion of the semiconducting material of a semiconductor fin to a non-semiconducting material.

The plain language of claims 1 and 18 requires removing a portion of the semiconductor fin to provide the semiconductor fin with a second, smaller height. *See also* claim 13 (requiring removal of a portion of the first semiconductor fin to provide a first fin-type transistor structure a first channel region having a first channel width and removing a portion of the second semiconductor fin to provide a second fin-type transistor structure a second channel region having a second channel width). Thus, the plain language of claims 1 and 18 requires removal of a portion of the semiconductor fin to achieve a smaller height but does not expressly state that the smaller height of the semiconductor fin must be achieved through the *physical* removal of material. Similarly, claim 13 does not expressly state that the removal of a portion of the first or second semiconductor fin to provide a first or second channel width must be achieved through the physical removal of material.

Patent Owner argues the '303 patent refers to "removing" as "actually taking away or eliminating material through, for instance, etching." PO Resp. 45; *see also id.* at 45–49 (citing Ex. 1001, Figs. 2–5, 2:46–49, 2:56–58, 2:65–3:1, 3:47–59, 3:66–4:7; Ex. 2004 ¶¶ 41, 42). The

Specification, however, does not limit how the semiconducting portion of the fin is to be removed to any particular method. Rather, the Specification describes etching in connection with the disclosed embodiments, which are illustrative, not restrictive. *See* Ex. 1001, 1:39–49 (stating Figures 1–8 illustrate a specific embodiment), 8:49–54 (stating the disclosed subject matter is considered illustrative, not restrictive). We decline to limit claim terms to the embodiments described in the Specification.

Our construction that "removing a portion" of a "semiconductor fin" means "eliminating a portion of the semiconductor fin" is consistent with the plain and ordinary meaning of "removing." Patent Owner agrees that the plain meaning of the "removing" includes "eliminating." *See, e.g.*, PO Resp. 48–49 ("removing material from a semiconductor fin, *i.e.,* taking it away or eliminating it, so as to reduce the height of the fin"). Indeed, Patent Owner has submitted a definition of "remove" into the record of this proceeding that defines "remove" as "5. To do away with; eliminate . . . ." Ex. 2007; *see also* Ex. 2004 ¶¶ 40–41 (stating the plain meaning of the term remove is confirmed by a multitude of dictionaries and citing Exhibit 2007).

Patent Owner also argues that because the '303 patent describes a process of adding a gate dielectric layer through a process of thermal oxidation that occurs *after* removal of a portion a semiconductor fin to remove height, a POSITA would understand that the '303 patent does not consider thermal oxidation to constitute removing a portion of a fin or reducing the fin's height. *See* PO Resp. 49 (citing Ex. 2004 ¶ 46). Patent Owner argues that "this makes ample sense because thermal oxidation does not result in taking away or eliminating any material." *Id.* This argument is not persuasive because the methods described in the '303 patent to form a

gate dielectric layer are not limited to thermal oxidation, but also include other techniques such as chemical vapor and physical vapor deposition, that do not involve the conversion of a semiconductor layer into a non-conducting layer. *See* Ex. 1001, 4:26–31.

We also are not persuaded by Patent Owner's argument that a construction of "removing a portion" of a semiconductor fin through a dry/wet oxidation process is inconsistent with the prosecution history. *See* PO Resp. 50–51. Patent Owner contends the claims of the '303 patent were allowed over a reference (i.e., Kaneko) that discloses "forming a gate dielectric" prior to deposition of a gate conductor. *Id.* at 50. Patent Owner asserts that "[h]ad the common oxidation techniques for formation of such a dielectric been seen as removal of a portion of a semiconductor fin . . . then it is difficult to see how claim 1 was allowed over Kaneko," which, "like Chau, forms a gate dielectric from its fin." *Id.* (citing US 7,214,576 B1, 6:21–22, issued May 8, 2007 (Ex. 2010)). This argument is not persuasive because the process discussed in Kaneko merely discusses the formation of a gate dielectric generally, and not the specific method of forming a gate dielectric by converting a semiconducting material into a gate dielectric. *See* Ex. 2010, 6:21–22 (merely stating "formation of a gate dielectric").

Finally, our understanding that the height of a semiconducting fin only includes the semiconducting portion and does not include the non-semiconducting gate dielectric located above the semiconducting portion was confirmed during oral argument. Specifically, counsel for Patent Owner confirmed that the semiconducting portion of the fin shown in Figure 6 of the '303 patent only included the semiconducting layer portion

of the fin (element 18) and did not include the non-semiconducting gate dielectric layer (element 64). *See* Tr. 49:20–50:13.

Thus, for the foregoing reasons, we determine that the broadest reasonable interpretation of "removing a portion" of a "semiconductor fin" consistent with the Specification means "eliminating a portion of the semiconductor fin." Eliminating a portion of the semiconductor fin can include converting a portion of the semiconducting material of a semiconductor fin to a non-semiconducting material.

3. When Must the Second (or Third) Semiconductor Fin Have the First Height of the First Semiconductor Fin?

In general, claim element 1[a] requires forming a first semiconductor fin having a "first height" and claim step 1[b] requires removing a portion of the first semiconductor fin to provide the first semiconductor fin with a second, smaller, height. *See* Ex. 1001, 8:61–67. In general, claim 2 requires forming a second semiconductor fin prior to removing a portion of the first fin, wherein the second fin has the first height of the first fin. *Id.* at 9:1–5. Claim 11, which depends from claim 2, further requires forming a third semiconductor fin prior to removing the portion of the first semiconductor fin portion, "the third semiconductor fin having the first height." *Id.* at 9:39–43.

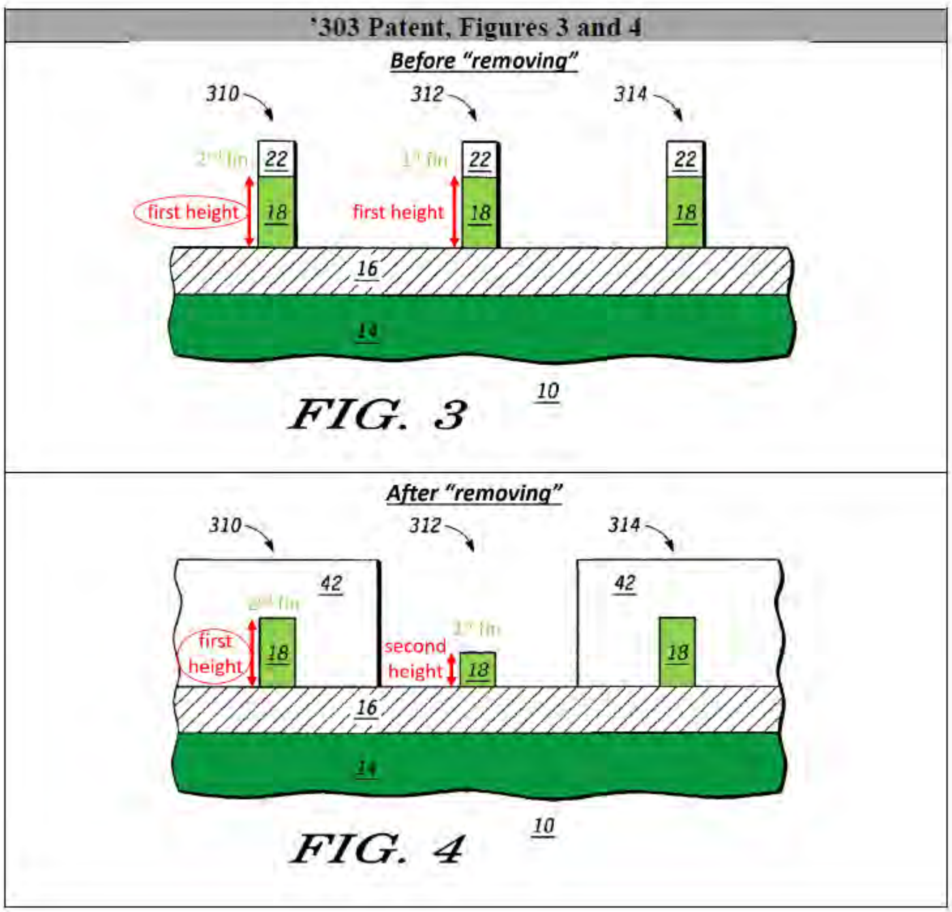
Petitioner contends that because claims 2 and 11 do not specify when the height of the second or third semiconductor fin is measured (i.e., the claims do not specify whether the second/third semiconductor fin has the first height *before* or *after* removing the portion of the first semiconductor fin), claims 2 and 11 can be interpreted to encompass processes where the second/third semiconductor fin has the same "first height" either (1) *prior to*

removing a portion of the first semiconductor fin or (2) *after* removing a portion of the first semiconductor fin. *See* Pet. 29–31. Petitioner asserts that under the second construction, the limitations regarding fin height "refer to the fin dimensions of the *final* FinFET devices (i.e., *after* removing the portion of the *first semiconductor fin*.)." *Id.* at 30 (italics and underlining in original, color font omitted).

In our Decision to Institute, we noted Patent Owner's Preliminary Response did not comment on Petitioner's alternative claim constructions. *See* Dec. Inst. 17. We also noted that we need not resolve this claim construction issue because Petitioner had shown a reasonable likelihood of establishing that Yu discloses the limitations of claims 2 and 11 under either interpretation. *See id.*

For the purposes of this Final Decision, upon consideration of the entire record, we determine that claims 2 and 11 do not limit when the height of the second or third semiconductor fin has the first height. Therefore, claim 2 (and claim 11) can encompass the situation where the second (and third) fin have the same first height of the first semiconductor fin either *prior to* removing a portion of the first semiconductor fin or *after* removing a portion of the first semiconductor fin, which would include the dimensions of the fins in a final FinFET device after all processing steps have been completed. This construction is supported by the plain language of the claims, which do not specify when the height of the second fin (claim 2) or of the third fin (claim 11) has the first height. Nor do claims 2 and 11 require the second fin (claim 2) or the third fin (claim 11) to have the first height in a finished FinFET device.

Our construction is also consistent with the Specification. As shown in Figures 3 and 4, with annotations provided by Petitioner and reproduced below (Pet. Reply 21), the height of a second semiconductor fin (e.g., layer 18 at location 310) and the height of a third semiconductor fin (e.g., layer 18 at location 314) can have a first height of the first semiconductor fin (e.g., layer 18 at location 312 in Figure 3) either *before* (Figure 3) or *after* (Figure 4) removing the portion of the first semiconductor fin at location 312.



As shown in Figures 3 and 4 above, with annotations provided by Petitioner (Pet. Reply 21), Figure 3 illustrates a second semiconductor fin (e.g., layer 18 at location 310) and a third semiconductor fin (e.g., layer 18 at

location 314) that have the same first height of the first fin (layer 18 at location 312 in Figure 3) both before (Figure 3) and after (Figure 4) a portion of the first semiconductor fin has been removed to provide a first semiconductor fin with a second height that is smaller than the first height (e.g., layer 18 at location 312 in Figure 4).

Our construction also is supported by the language of claim 8, which depends from claim 2 and further requires that the second semiconductor fin has the first height after removing a portion of the first semiconductor fin. Ex. 1001, 9:28–30. The additional limitation of claim 8 (that requires the second semiconductor fin to have the first height after removing a portion of the first semiconductor fin) creates a presumption that the limitation is not present in claim 2. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1315 (Fed. Cir. 2005) (*en banc*) (stating the presence of a dependent claim that adds a particular limitation gives rise to a presumption that the limitation in question is not present in the independent claim). As such, we determine that claim 2 is broad enough to encompass circumstances in which the second semiconductor fin has the first height either before or after removing a portion of the first semiconductor fin. Similarly, claim 11 is broad enough to encompass circumstances in which the third semiconductor fin has the first height either before or after removing a portion of the first semiconductor fin.

D. Asserted Anticipation of Claims 1–6, 8–11, and 18 by Yu

Petitioner asserts claims 1–6, 8–11, and 18 are unpatentable under 35 U.S.C. §§ 102(a) and (e) as anticipated by Yu. Pet. 3, 20–42 (citing Ex. 1002). Patent Owner opposes. *See generally* PO Resp. Having considered the parties' contentions and supporting evidence, we determine

that Petitioner has established by a preponderance of the evidence that claims 1–6, 8–11, and 18 are anticipated by Yu.

1. Yu

Yu, titled "Varying Carrier Mobility in Semiconductor Devices to Achieve Overall Design Goals," is directed to "forming semiconductor devices" by forming different fins with differing aspect ratios. Ex. 1003, [54], [57]. Specifically, Yu teaches that "[t]he first height and the second height may be configured so that a carrier mobility of the N-type device approximately equals a carrier mobility of the P-type device." *Id.* ¶ 10. Yu further teaches that "fin heights of different devices 710/720 (e.g., heights H1 and H2) may be selected by selectively masking some fins 130 and etching other exposed fins 130 to reduce their heights." *Id.* ¶ 73.

2. Independent Claim 1

a) Preamble and Claim Element 1[a]

The preamble and claim element 1[a] recite

> A process for forming an electronic device comprising:
> [a] forming a first semiconductor fin for a first fintype transistor structure over a support layer of a substrate, wherein, the first semiconductor fin has a first height;

Ex. 1001, 8:60–63.

Petitioner contends, *inter alia*, Yu discloses a process for forming an electronic device (semiconductor device 100) comprising forming a first semiconductor fin (silicon layer 130) for a first fintype transistor structure (FinFET devices) over a support layer (silicon substrate layer 110) of a substrate (layers 110, 120, 130). Pet. 20–21 (citing Ex. 1003 ¶¶ 1, 5, 23–32, 46, 67, 73–75, 79, Figs. 1, 2A, 2B, 3A; Ex. 1002 ¶¶ 64, 66); *see also id.* at 23–24 (citing Ex. 1002 ¶ 67).

Petitioner also contends the first semiconductor fin (layer 130) has a first height H from about 300 angstroms to 1500 angstroms, measured from the base to the top of the fin. Pet. 24–25 (citing Ex. 1003 ¶¶ 24–25, Figs. 1, 2A, 2B). Petitioner also points to Yu's Figure 4A, which illustrates height H and width W for fin 130 in pi-gate FinFET 400. *Id.* at 25. Petitioner also states Yu teaches different types of FinFETs, including a double gate FinFET, and that the height and width of these devices would be similarly situated. *Id.* (citing Ex. 1002 ¶ 70; Ex. 1003 ¶¶ 38, 45, 46).

We agree with and adopt Petitioner's analysis and find Yu discloses the limitations recited in the preamble and by claim element 1[a]. We are not persuaded by Patent Owner's arguments for the following reasons.

Patent Owner argues Petitioner fails to demonstrate that Yu meets the "height" limitation of claim 1 because the Petition fails to identify a *surface* from which the *transistor structure is subsequently formed*. *See* PO Resp. 2–10. This argument is not persuasive as Petitioner has persuasively shown Yu discloses first semiconductor fin (i.e., 130) having a first height (i.e., height "H"). Petitioner states Figure 4A of Yu illustrates "height H" for fin 130. Pet. 25–26 (citing Ex. 1003, Fig. 4A). As shown in Figure 4A, the height "H" of semiconductor fin 130 extends from the base of the fin, which is resting on layer 120, to the top of the fin. Thus, the Petition persuasively identifies layer 120 as a surface from which the transistor structure is subsequently formed and persuasively identifies the height of the fin as height "H."

Patent Owner further contends that Petitioner has not identified the "transistor structure" that is formed from the surface. PO Resp. 4 (citing Ex. 2004 ¶ 35). This argument also is not persuasive as Petitioner has

provided persuasive argument and evidence that Yu's FinFET devices (e.g., FinFET 400) are transistor structures as required by the claims. *See, e.g.*, Pet. 24–25 (citing Ex. 1003 ¶¶ 23, 24, 32, 67, Figs. 1, 7; Ex. 1002 ¶ 68). We also disagree with Patent Owner's argument that Petitioner has failed to show Yu discloses a transistor structure that is "formed from" the same material as the surface. *See* PO Resp. 6–8 (stating "it is difficult to grasp how a transistor structure is formed *from* (rather than formed *over*) the top surface of the insulator, let alone why that is the only surface from which a transistor structure is formed" (emphasis added)). Our construction of the term "height" does not require that the transistor structure be formed from the same material as the surface material. Rather, as defined in the '303 patent Specification, "height" is the "physical dimension of distance from the base to the top of a structure in a direction substantially perpendicular to a primary surface," wherein the primary surface is a "surface from which a transistor structure is subsequently formed." Ex. 1001, 5:61–63, 6:21–24; *see also id.* at 5:63–6:3 (stating the primary surface may be an original surface of a substrate before forming any components, may be a surface of a semiconductor layer that overlies the base material, or may be a surface that becomes exposed during processing).

Accordingly, for the foregoing reasons and based on the complete record, Petitioner has shown by a preponderance of the evidence that Yu discloses the preamble and the limitations of claim element 1[a].

b) Claim element 1[b]

Claim element 1[b] recites "removing a portion of the first semiconductor fin to provide the first semiconductor fin with a second

height, wherein the second height is smaller than the first height." Ex. 1001, 8:65–68.

Petitioner argues Yu's disclosure of selectively masking some fins 130 and etching other exposed fins 130 to reduce their height, discloses the limitations of claim element 1[b]. Pet. 27–28 (citing Ex. 1003 ¶¶ 71, 73–74, Fig. 7; Ex. 1002 ¶¶ 72–73).

We agree with and adopt Petitioner's analysis and find Yu discloses the limitations of claim element 1[b]. *See id.* Patent Owner has not raised arguments specifically against this limitation in its Patent Owner Response; therefore, any such arguments are waived. *See Novartis AG v. Torrent Pharm. Ltd.*, 853 F.3d 1316, 1330 (Fed. Cir. 2017); *In re NuVasive*, 842 F.3d 1376, 1381 (Fed. Cir. 2016).

c) Summary

Upon considering all of the evidence of record, we determine that Petitioner has shown by a preponderance of the evidence that Yu discloses each of the limitations of, and therefore anticipates, claim 1.

3. Claims 2 and 11

Claim 2 recites

> The process of claim 1, further comprising:
>
> forming a second semiconductor fin for a second fin-type transistor structure over the support layer prior to removing the portion of the first semiconductor fin, wherein the second semiconductor fin has the first height.

Ex. 1001, 9:1–5. Claim 11 is similar to claim 2, but requires forming a *third* semiconductor fin prior to removing the portion of the first semiconductor fin portion, the third semiconductor fin having the first height.

Petitioner contends that claims 2 and 11 are anticipated by Yu regardless of whether the height of the second fin (claim 2) or the height of the third fin (claim 11) is measured either (1) before or (2) after removing a portion of the first fin (i.e., in the finished FinFET device). *See* Pet. 30 (citing Ex. 1003 ¶¶ 24–31, 66–67, 74, Fig. 7; Ex. 1002 ¶ 76). For example, Petitioner asserts Yu discloses forming second fins in parallel with first fins and contends that a second fin that was formed in parallel with a first fin would have the same "first" height of the first fin. *See id.* (citing Ex. 1003 ¶¶ 24–31, 66–67, 74, Fig. 7; Ex. 1002 ¶ 76). Under this scenario, Petitioner argues, Yu discloses a process where the second fin has the same first height of the first fin before a portion of the first semiconductor fin was removed. *See id.*

Petitioner also asserts that Yu discloses a final FinFET device in which the second and third fins were formed prior to removing a portion of the first fin, the first fin was selectively masked and etched to have a second height smaller than the first height of the second and third fins, and that selectively masking some fins and etching other exposed fins reduces the fins' heights. *Id.* at 31 (citing Ex. 1003 ¶ 73). In this situation, Petitioner contends, the second fin is formed prior to removing a portion of the first fin, and after the selective masking and etching of a first fin, the first fin would have a second height that is smaller than the first height of the second fin. *Id.*

Patent Owner does not dispute that Yu discloses all of the limitations of claims 2 and 11 under either interpretation. *See generally* PO Resp. Rather, Patent Owner argues that because Petitioner provides two different claim constructions for claims 2 and 11, Petitioner is implicitly arguing the

claims are indefinite and, therefore, the claims "are not suitable for IPR." PO Resp. 10; *see also id.* at 1 (stating that under "*Miyazaki*, a claim subject to two interpretations is indefinite" and that "[b]ecause Petitioner essentially contends that claims [2, 11, and their dependent claims] are indefinite, under the Board's caselaw, its anticipation/obviousness theories are not suitable for consideration in IPR").

We are not persuaded by Patent Owner's arguments. First, we disagree Petitioner either explicitly or implicitly contends claims of the '303 patent are indefinite. Rather, Petitioner provides unpatentability arguments under alternative claim constructions. *See, e.g.*, Pet. 30–31; Reply 17–21. Providing unpatentability arguments under alternative claim constructions does not render the claims indefinite. Moreover, we disagree that claims are not "suitable for consideration in IPR" merely because a Petitioner presents unpatentability arguments under alternative claim constructions.

For the reasons stated above, we agree with Petitioner that Yu discloses each of the limitations recited in claims 2 and 11. Accordingly, based on the complete record, we find that Petitioner shows by a preponderance of the evidence that claims 2 and 11 are anticipated by Yu.

4. Claim 3

Claim 3 depends from claim 2 and further recites "wherein forming the first semiconductor fin and forming the second semiconductor fin comprises forming the first semiconductor fin and the second semiconductor fin from a semiconductor layer of the substrate." Ex. 1001, 9:6–10. Petitioner adequately shows Yu discloses forming first and second semiconductor fins formed from a semiconductor layer (e.g., silicon

layer 130) of the substrate (e.g., a silicon on insulator ("SOI") structure that includes silicon substrate 110). Pet. 31–32 (citing Ex. 1003 ¶¶ 24–31, Figs. 1, 2A, 2B 3A, 4B); *see also id.* at 21–22 (stating layers 110, 120, 130 serve as the claimed substrate). Patent Owner does not respond to this contention, and we find that Petitioner makes a sufficient showing. Accordingly, based on the complete record, we find that Petitioner shows by a preponderance of the evidence that claim 3 is anticipated by Yu.

5. Claim 4

Claim 4, which depends from claim 2, recites "wherein forming the second semiconductor fin occurs at a substantially same time as forming the first semiconductor fin." Ex. 1001, 9:11–13. Petitioner asserts Yu teaches forming a first and second semiconductor fin at substantially the same time. Pet. 32. We have reviewed and agree with Petitioner's assertions. *See id.* (citing Ex. 1003 ¶¶ 6, 8–10, 24–31, 66–74, Figs. 1, 2A, 2B, 3A, 4A, 4B, 7; Ex. 1002 ¶ 80). For example, Petitioner contends Yu teaches forming first and second fins as part of a single etching step, and therefore occur at substantially the same time. *Id.* (citing Ex. 1002 ¶ 81). Patent Owner does not specifically dispute Petitioner's assertions, and we find that Petitioner makes a sufficient showing. Accordingly, based on the complete record, we find that Petitioner shows by a preponderance of the evidence that claim 4 is anticipated by Yu.

6. Claim 5

Claim 5 recites the "process of claim 2, wherein the first semiconductor fin comprises a p-channel device, and the second semiconductor fin comprises an n-channel device." Ex. 1001, 9:14–16.

Petitioner contends that if we adopt its first proposed claim construction of claim 2 (i.e., the second fin can have the height of the first fin prior to removing a portion of the first fin—a construction that does not require the second semiconductor fin to have the first height in the finished FinFET device), then Yu discloses the limitations of claim 5 because Yu discloses a first semiconductor fin comprises a p-channel device (PMOS FinFETs), and a second semiconductor fin comprises an n-channel device (NMOS FinFETs). Pet. 33 (citing Ex. 1003 ¶¶ 10, 23, 31, 32, 68; Ex. 1002 ¶¶ 82–84).

As noted above in Section II.C.3, we do not construe claim 2 as requiring the second fin to have the same first height of the first semiconductor fin in a final FinFET device after all processing steps have been completed. Rather, claim 2 can encompass the situation where the second fin has the same first height of the first semiconductor fin *prior to* removing a portion of the first semiconductor fin.

Patent Owner does not dispute that claim 5 is anticipated under this claim construction. *See* PO Resp. 17–23.

For the reasons stated above, we agree with Petitioner that Yu discloses each of the limitations recited in claim 5. Accordingly, based on the complete record, we find that Petitioner shows by a preponderance of the evidence that claim 5 is anticipated by Yu.

7. Claim 6

Claim 6 depends from claim 2 and further recites "doping the first semiconductor fin with a n-type dopant after removing the portion of the first semiconductor fin; and doping the second semiconductor fin with an

p-type dopant after removing the portion of the first semiconductor fin." Ex. 1001, 9:17–22.

Petitioner adequately shows Yu discloses the doping steps of claim 6. Pet. 36–38 (citing Ex. 1003 ¶¶ 24–31, 71, Figs. 1, 2A, 2B, 3A, 4A, 4B, 7; Ex. 1002 ¶¶ 90–93). For example, Yu discloses implanting n-type or p-type impurities into source/drain regions 220 and 230. Ex. 1003 ¶ 31. Patent Owner does not respond to Petitioner's contentions, and we find that Petitioner makes a sufficient showing that Yu discloses the limitations of claim 6. Accordingly, based on the complete record, we find that Petitioner shows by a preponderance of the evidence that claim 6 is anticipated by Yu.

8. Claim 8

Claim 8 depends from claim 2 and further recites "wherein the second semiconductor fin has the first height after removing the portion of the first semiconductor fin." Ex. 1001, 9:28–30.

Petitioner argues Yu discloses each of the limitations of claim 8. Pet. 38–39 (citing Ex. 1003 ¶¶ 24, 25, 46, 73). Petitioner contends Yu discloses first and second semiconductor fins having the same first height when they are formed and then masking and etching the first fin so that the etched first fin has a shorter height while the masked second fin maintains the original first height. *Id.* at 38 (citing Ex. 1003 ¶¶ 24, 25, 46, 73; Ex. 1002 ¶ 92). Other than the arguments as to "height" discussed above, Patent Owner does not dispute Petitioner's contentions, and we find that Petitioner makes a sufficient showing. Accordingly, based on the complete record, we find that Petitioner shows by a preponderance of the evidence that claim 8 is anticipated by Yu.

9. Claims 9 and 10

Claim 9 depends from claim 2 and further recites "wherein forming the first semiconductor fin includes forming the first semiconductor fin from a semiconductor material with a (110) crystal plane for the fin sidewall." Ex. 1001, 9:31–34. Claim 10 also depends from claim 2 and further recites "wherein forming the second semiconductor fin includes forming the second semiconductor fin from a semiconductor material with a (110) crystal plan for the fin sidewall." *Id.* at 9:35–38.

Petitioner argues the silicon first and second fins of Yu have a cubic atomic lattice and satisfy the limitations of claims 9 and 10. Pet. 39–40 (citing Ex. 1003 ¶¶ 24–31, 39, 46, 47, 82). Patent Owner does not dispute Petitioner's assertions, and we find that Petitioner makes a sufficient showing. Accordingly, based on the complete record, we find that Petitioner shows by a preponderance of the evidence that claims 9 and 10 are anticipated by Yu.

10. Independent Claim 18

a) Preamble and Claim Elements 18[a]–[c]

The preamble and elements [a]–[c] of claim 18 recite:

> A process for forming an electronic device, comprising:
>
> [a] forming a first semiconductor fin for a first fin-type transistor structure, the first semiconductor fin having a first height;
>
> [b] forming a second semiconductor fin for a second fin-type transistor structure, the second semiconductor fin having the first height;
>
> [c] removing a portion of the second semiconductor fin to provide the second semiconductor fin with a second height smaller than the first height; and

Ex. 1001, 10:20–29.

Petitioner asserts Yu discloses these limitations for the same reasons Yu discloses the similar limitations recited in claims 1 and 2. *See* Pet. 39–40 (citing Ex. 1002 ¶¶ 103–106). Petitioner asserts, and Patent Owner does not dispute, that although claim element 1[b] recites removing a portion of the *first* semiconductor fin instead of the *second* semiconductor fin as recited in claim 18, there is no material distinction between the first and second semiconductor fins for the purposes of demonstrating that Yu teaches this limitation. *Id.* at 40, n.8; *see generally* PO Resp.

We have reviewed Petitioner's evidence and argument, which Patent Owner does not dispute, and agree that Yu discloses the preamble and the limitations of claim elements 18[a]–[c].

b) Claim Elements 18[d]–[e]

Claim elements 18[d]–[e] recite

> [d] forming a first gate electrode overlying the first semiconductor fin wherein a first channel region of the first semiconductor fin has a first channel width approximately equal to twice the first height; and
>
> [e] forming a second gate electrode overlying the second semiconductor fin wherein a second channel region within the second semiconductor fin has a second channel width approximately equal to twice the second height.

Ex. 1001, 10:30–37.

Petitioner asserts Yu's disclosure of forming gate structure 330, which includes an electrode, that extends across a channel region of fin structure 210, discloses forming the recited first and second electrodes overlying the first and second fins. Pet. 40–42 (citing Ex. 1003 ¶¶ 34, 35, 37, 40–44, Figs. 3A, 3B, 4A, 4B, and 7; Ex. 1002 ¶ 107). Petitioner further

asserts that Yu's disclosure of a double-gate FinFET in which channels exist along the two sidewalls of the fins satisfies the limitations requiring the first channel and second channel regions of the semiconductor fin to have a first and second channel width approximately equal to twice the first height. Pet. 41–42 (citing Ex. 1003 ¶¶ 38, 45 Figs. 3A, 3B; Ex. 1002 ¶ 108).

Other than the arguments set forth above regarding claim 1, Patent Owner does not dispute Petitioner's assertions. We have reviewed Petitioner's arguments and evidence and find Petitioner has persuasively shown Yu discloses each of the limitations of claim elements 18[d]–[e].

c) Summary

Upon considering all of the evidence of record, we determine that Petitioner has shown by a preponderance of the evidence that Yu discloses each of the limitations of claim 18 and that claim 18 is unpatentable as anticipated by Yu.

E. Asserted Obviousness of Claim 7 Based on Yu and Brask

Claim 7, which depends indirectly from claim 1, recites that the step of forming the first semiconductor fin "comprises forming the first semiconductor fin from an n-doped semiconductor region," and forming "the second semiconductor fin comprises forming the second semiconductor fin from a p-doped semiconductor region." Ex. 1001, 9:23–27.

Petitioner contends that the combination of Yu and Brask teaches the subject of claim 7. Pet. 42–45 (citing Ex. 1003 ¶¶ 24–31, 40–48, Figs. 1, 2A, 2B, 3A, 4A, 4B; Ex. 1004 ¶¶ 17, 20–21, 46, 47, 52, 53, Figs. 5A, 5B). Petitioner contends that, although Yu does not specify whether silicon layer 130 contains n-doped and p-doped semiconductor regions, forming such fins was well known and was taught in Brask. *See id.* at 42 (citing

Ex. 1004 ¶¶ 45, 46, 51, 52, Figs. 5A, 5B; Ex. 1002 ¶ 111). Petitioner asserts that a POSITA would have been motivated to combine Brask's teachings of forming fins from n-doped and p-doped regions to facilitate the formation of NMOS and PMOS FinFET devices of Yu from n-doped and p-doped regions with a reasonable expectation of success. *Id.* at 44–45 (citing Ex. 1002 ¶ 114). Petitioner also asserts that such a combination would have yielded the predictable results of forming NMOS or PMOS FinFET devices and that doing so would have been a simple application of a well-known technique to yield predictable results. *Id.* (citing Ex. 1002 ¶ 114).

Patent Owner does not dispute Petitioner's assertions, and we find that Petitioner makes a sufficient showing that the combination of Yu and Brask teaches each of the limitations of claim 7 and Petitioner provides sufficient reasoning with rational underpinning for combining the teachings of Yu and Brask.

Based on the complete record, we conclude that Petitioner shows by a preponderance of the evidence that claim 7 is unpatentable under 35 U.S.C. § 103(a) as it would have been obvious over the combination of Yu and Brask.

F. Asserted Anticipation of Claims 1–7, 9–11, 13, 14, and 16 by Chau

Petitioner asserts claims 1–7, 9–11, 13, 14, and 16 are unpatentable under 35 U.S.C. §§ 102(a) and (e) as anticipated by Chau. Pet. 3, 20–42 (citing Ex. 1002). Patent Owner opposes. *See generally* PO Resp. Having considered the parties' contentions and supporting evidence, we find that Petitioner has shown by a preponderance of the evidence that claims 1–7, 9–11, 13, 14, and 16 are anticipated by Chau.

1. Chau

Chau is directed to a "novel tri-gate transistor structure and its method of fabrication." Ex. 1005 at [54], [57], ¶ 20. Chau teaches that the "tri-gate transistor includes a thin semiconductor body formed on a substrate, the substrate can be an insulating substrate or a semiconductor substrate." *Id.* ¶ 21; *see also id.* ¶ 46 (stating "semiconductor film 508 is etched to form semiconductor bodies or fins 520"). Additionally, the tri-gate transistor has a source region and drain region formed in the semiconductor body on opposite sides of the gate electrode. *See id.* ¶ 28. The source region and drain region are formed of the same conductivity type such as N-type or P-type conductivity. *Id.* The gate dielectric and gate electrode "surround[] the semiconductor body on three sides, the tri-gate transistor is characterized in having three channels and three gates . . . . [such that] the gate width of transistor 300 is equal to the height 320 of silicon body 308 at sidewall 310, plus the width of silicon body of 308 at the top surface 316, plus the height 320 of silicon body 308 at sidewall 312." *Id.* ¶ 30. Moreover, the "fins or silicon body 702 can then be thermally oxidized by any well-known process, such as by a wet oxidation (H_2O) or a combination of dry/wet oxidation to form the dielectric film 710." *Id.* ¶ 62.

2. *Independent Claim 1*

a) *Preamble and Claim Element 1[a]*

The preamble and claim element 1[a] recite

> A process for forming an electronic device comprising:
>
> [a] forming a first semiconductor fin for a first fintype transistor structure over a support layer of a substrate, wherein, the first semiconductor fin has a first height;

Ex. 1001, 8:60–63. Petitioner contends, *inter alia*, Chau discloses a process for forming an electronic device (tri-gate transistor) comprising forming a first semiconductor fin (e.g., silicon substrate 508) for a first fintype transistor structure (e.g., FinFET devices, such as NMOS and PMOS FinFETs) over a support layer (e.g., silicon substrate 504) of a substrate (e.g., layers 504, 506, 508). Pet. 46–49 (citing Ex. 1005 ¶¶ 21, 23, 24, 41–43, 46, Figs. 5A–E; Ex. 1002 ¶¶ 118–120).

Petitioner also contends Chau discloses a first semiconductor fin (e.g., semiconductor film 508) that is formed to a thickness approximately equal to the height desired for the subsequently formed body of the fabricated tri-gate transistor. *Id.* (citing Ex. 1005 ¶ 40). For example, Petitioner asserts, semiconductor film 508 may have a "thickness or height 509 of less than 30 nanometers." *Id.* (quoting Ex. 1005 ¶ 43).

We agree with and adopt Petitioner's analysis and find Chau discloses the limitations recited in the preamble and claim element 1[a]. We are not persuaded by Patent Owner's arguments for the following reasons.

Patent Owner argues Petitioner fails to demonstrate that Chau meets the "height" limitation of claim 1 because the Petition fails to identify a *surface* from which the *transistor structure is subsequently formed*. *See* PO Resp. 2–10. This argument is not persuasive as Petitioner has

persuasively shown Chau discloses forming a first semiconductor fin (semiconductor film 508) to a thickness equal to the desired height of the subsequently formed transistor body and that this thickness can be less than 30 nanometers. *See* Pet. 47–49. As shown in Figures 5A and 5B of Chau, semiconductor film 508 is on top of buried oxide layer 506. Thus, the Petition persuasively identifies layer 506 as a surface from which the transistor structure is subsequently formed and persuasively identifies a first height of the fin.

Patent Owner further contends that Petitioner has not identified the "transistor structure" that is formed from the surface. *See* PO Resp. 4–6. This argument also is not persuasive as Petitioner has provided persuasive argument and evidence that Chau's NMOS and PMOS FinFET devices are transistor structures as required by the claims. *See, e.g.*, Pet. 48–49. We also disagree with Patent Owner's argument that Petitioner has failed to show Chau discloses a transistor structure that is "formed from" the same material as the surface. *See* PO Resp. 6–8. As noted above in Section II.C.1, our construction of the term "height" does not require that the transistor structure be formed from the same material as the surface material.

Accordingly, for the foregoing reasons, Petitioner has shown by a preponderance of the evidence that Chau discloses the limitations of claim element 1[a].

b) Claim Element 1[b]

Claim element 1[b] recites

> [b] removing a portion of the first semiconductor fin to provide the first semiconductor fin with a second height, wherein the second height is smaller than the first height.

Ex. 1001, 8:65–67.

Petitioner contends Chau's disclosure of a thermal oxidization process that converts a portion of the silicon (a semiconducting material) of the first semiconductor fin into silicon dioxide (a non-semiconducting material) to form a non-semiconducting gate dielectric layer 526, satisfies the limitations of claim element 1[b]. *See* Pet. 49–50 (citing Ex. 1005 ¶ 47). Petitioner also points to Chau's Figure 7A as illustrating how a portion of silicon body 702 is thermally oxidized to form the dielectric film 710. *Id.* at 50–51 (citing Ex. 1005 ¶ 62, Fig. 7A); *see also* Ex. 1005 ¶ 58 (stating gate dielectric layer 710 includes a first portion 712 formed on the top surface 704 of semiconductor body 702). Petitioner explains that during the oxidation process, a portion of Chau's silicon fin reacts with oxygen to form a non-semiconducting silicon gate dielectric of silicon dioxide. Pet. 50–51 (citing Ex. 1005, Fig. 7A). Petitioner contends that Chau's Figure 7A illustrates that the height of the semiconductor fin 702 decreases from 710 to 712. *Id.* Petitioner argues that the conversion of a portion of the semiconducting silicon material of the first semiconductor fin to a non-semiconducting gate dielectric satisfies the "removing a portion of the first semiconductor fin" requirement of claim element 1[b]. *Id.*

Patent Owner contends Chau does not anticipate because Chau's oxidation process does not involve "removing silicon." PO Resp. 53; *see also id.* at 54 (stating even if "solid silicon is transformed or converted, it is not 'removed'"); *see generally id.* at 41–57.

We disagree with Patent Owner's argument because it is based on a claim construction argument that we do not adopt. As stated above in Section II.C.2, although our Decision to Institute suggested a different preliminary claim construction, upon consideration of the full record

developed during trial, we determine that the step of "removing a portion of [a] semiconductor fin" can include removing the semiconducting portion of a semiconductor fin by converting a portion of the semiconducting material of the fin into a non-semiconductor material.

Patent Owner does not dispute that during Chau's thermal oxidation process silicon is converted into silicon dioxide. *See* PO Resp. 23–54; *see also* Ex. 2004 ¶ 44 (Dr. Neikirk stating that silicon is converted to silicon dioxide in both wet and dry oxidation processes). We find that the conversion of a portion of the silicon of Chau's semiconductor fin to silicon dioxide results in the removal of a portion of the first semiconductor fin as required by claim 1. Dr. Neikirk admits that Chau's dielectric 710 is "formed in part by consuming some of the . . . crystalline silicon and converting it into silicon dioxide." Ex. 1018, 114:13–15; *see also id.* at 114:1–8 (stating that, in Chau's Figure 7, gate dielectric film 712 has been formed using a portion of silicon body 702). Dr. Neikirk further admits that after oxidation the distance from the bottom to the top of the crystalline silicon portion would be a smaller number. *Id.* at 115:7–9 (stating the "distance from bottom to top of the crystalline silicon portion would be a smaller number. The distance from the bottom to the top of the gate insulator, which consists of both oxygen and the original silicon, will actually be larger"); *see also id.* at 108:3–9, 110:25–111:8; Ex. 1016.

For the foregoing reasons, we determine Chau's disclosure of forming a gate dielectric layer on and around a semiconductor body (semiconductor fin) through a thermal oxidation process, converts a portion of the semiconducting material, silicon, of the fin into a non-semiconducting material, silicon dioxide. We find that the conversion of a portion of the

semiconducting material (i.e., silicon) of the semiconductor fin to a non-semiconducting material (i.e., silicon dioxide) eliminates a portion of the semiconducting material of the fin and, thus, discloses "removing a portion of the first semiconducting fin" as required by claim 1.

c) Summary

Based on the complete record, we find that Petitioner shows by a preponderance of the evidence that Chau discloses each of the limitations of, and therefore anticipates, claim 1.

3. Claims 2 and 11

Petitioner contends that claims 2 and 11 are anticipated by Chau regardless of when the height of the second fin (claim 2) or the height of the third fin (claim 11) is measured (i.e., either (1) before or (2) after removing a portion of the first fin, i.e., in the finished FinFET device). *See* Pet. 50–54 (citing Ex. 1005 ¶¶ 21, 23, 24, 29, 38, 39, 41–43, 45, 46, 49, Figs. 5A–E; Ex. 1002 ¶¶ 124–128). For example, Petitioner asserts Chau discloses fabrication of PMOS and NMOS tri-gate devices on the same insulating substrate. *Id.* at 52. Petitioner further asserts Chau discloses forming multiple fins in Figure 5E, which illustrates a photoresist mask containing a pattern that define locations where semiconductor fins will be subsequently formed in the semiconductor film. *See id.* (citing Ex. 1005 ¶ 43, Fig. 5E). After forming the photoresist mask, semiconductor film 508 is etched to form silicon bodies or fins as shown in Figure 5C. *Id.* (citing Ex. 1005 ¶ 45; Ex. 1002 ¶ 126). Petitioner contends that because the fins are formed from semiconductor film 508, the second and third fins would have the same height as the height of the first fin. *Id.* at 53 (citing Ex. 1005 ¶ 40; Ex. 1002 ¶ 127). Petitioner further contends that because Chau describes a subsequent

step of thermally oxidizing the fin, the second and third fins must be formed prior to removing the first fin. *Id.* at 53–54 (citing Ex. 1005 ¶ 62; Ex. 1002 ¶ 128).

Patent Owner does not dispute that Chau discloses all of the limitations of claims 2 and 11 under either interpretation. *See generally* PO Resp. Rather, Patent Owner makes the same arguments as set forth regarding Yu, namely that because Petitioner provides two different claim constructions for claims 2 and 11, Petitioner is implicitly arguing the claims are indefinite and, therefore, the claims "are not suitable for IPR." PO Resp. 10; *see also id.* at 1 (stating that under "*Miyazaki*, a claim subject to two interpretations is indefinite" and that "[b]ecause Petitioner essentially contends that claims [2, 11, and their dependent claims] are indefinite, under the Board's caselaw, its anticipation/obviousness theories are not suitable for consideration in IPR").

We are not persuaded by Patent Owner's arguments for the same reasons set forth in Section II.D.3 above.

For the reasons explained by Petitioner, we agree that Chau discloses each of the limitations recited in claims 2 and 11. Pet. 51–53. Accordingly, based on the complete record, we find that Petitioner has shown by a preponderance of the evidence that claims 2 and 11 are anticipated by Yu.

4. *Independent Claim 13*

a) *Preamble and Claim Elements 13[a]–[b]*

The preamble and claim elements 13[a]–[b] recite:

> A process for forming an electronic device, comprising:
>
> [a] forming a first semiconductor fin over a support layer of a substrate;

> [b] forming a second semiconductor fin over the support layer;

Petitioner asserts Chau discloses these limitations for the same reasons Chau discloses the similar limitations recited in claims 1 and 2. *See* Pet. 62 (citing Ex. 1002 ¶¶ 140–142).

We have reviewed Petitioner's evidence and argument and agree that Chau discloses these limitations of claim elements 13[a]–[b] for the same reasons stated above in Sections II.F.2 and II.F.3.

b) Claim Elements 13[c]–[d]

Claim element 13[c]–[d] recite

> [c] removing a portion of the first semiconductor fin to provide a first fin-type transistor structure a first channel region having a first channel width; and
>
> [d] removing a portion of the second semiconductor fin to provide a second fin-type transistor structure with a second channel region having a second channel width.

Ex. 1001, 10:1–6.

Petitioner asserts Chau's thermal oxidation process discloses the removing limitations of claim elements 13[c]–[d]. *See* Pet. 62–65 (citing Ex. 1005 ¶¶ 47, 62, Fig. 7A; Ex. 1002 ¶¶ 143–149). For example, Petitioner asserts Chau discloses forming gate dielectric layer 526 on and around each semiconductor body 520 using a thermal oxidation process and that this process results in the removal of a portion of the first and second semiconductor fins. *Id.* at 62–65. Petitioner asserts that because the thermal oxidation process occurs across the entire fin, including the portion of the fin that will eventually become the channel region of the FinFET, Chau teaches "a first channel region having a first channel width." *Id.* at 63 (citing Ex. 1002 ¶ 144). Petitioner further asserts that because the thermal

oxidation process occurs across multiple fins, a second fin would also have a second channel region having a second channel width. *Id.* at 65 (citing Ex. 1002 ¶¶ 147–149).

Other than arguing a thermal oxidation process does not "remove" a portion of the fins because the process does not remove the silicon atoms, Patent Owner does not dispute that Chau discloses the limitations of claim elements 13[c]–[d]. *See generally* PO Resp. We are not persuaded by Patent Owner's arguments because they are based on a claim construction that we did not adopt.

We have reviewed Petitioner's arguments and evidence and determine that Petitioner has persuasively shown Chau discloses each of the limitations of claim elements 13[c]–[d].

c) Summary

Based on the complete record, we find that Petitioner shows by a preponderance of the evidence that Chau discloses each of the limitations of claim 13 and, therefore, claim 13 is unpatentable as anticipated by Chau.

5. Dependent Claims 3–7, 9, 10, 14, and 16

Petitioner asserts that Chau discloses each of the limitations of dependent claims 3–7, 9, 10, 14, and 16. *See* Pet. 54–61, 65.

For example, Petitioner asserts Chau discloses limitations of claim 3, which require that the forming of the first and second semiconductor fins comprise forming the fins "from a semiconductor layer of the substrate" for the same reasons set forth with respect to claim element 1[a] and claim 2. *See* Pet. 54 (stating Chau discloses forming fins from a semiconductor layer (semiconductor film 508) that is over support layer (silicon substrate 504) of the substrate (layers 504, 506, 508)).

Petitioner further argues Chau discloses forming a first semiconductor fin that comprises a p-channel device and a second semiconductor fin that comprises an n-channel device as required by claim 5. Pet. 57–58 (citing Ex. 1005 ¶¶ 29–31, 33, 39, 49; Ex. 1002 ¶¶ 131–32). Petitioner states that Chau discloses fabrication of both PMOS and NMOS tri-gate devices that can be fabricated "on the same insulating substrate" and further discloses the different manner in which fins of PMOS and NMOS devices are doped. *Id.* at 57 (citing Ex. 1005 ¶¶ 29–31, 33, 39, 49; Ex. 1002 ¶ 132). Petitioner further argues Chau discloses a first channel region of an n-channel transistor (as required by claim 14) or of a p-channel resistor (as required by claim 16) for the same reasons set forth in connection with claim 5. *Id.* at 65.

We have reviewed Petitioners evidence and argument and determine that Petitioner has sufficiently shown that Chau discloses each of the limitations of dependent claims 3–7, 9, 10, 14, and 16. Patent Owner does not present evidence or argument directed particularly to these dependent claims. Accordingly, based on the complete record, we determine that Petitioner has shown by a preponderance of the evidence that claims 3–7, 9, 10, 14, and 16 are anticipated by Chau.

G. Asserted Obviousness of Claims 2, 5, 8, 11, and 15 over Chau and Yu

Petitioner contends that if we construe the "height" of the semiconductor fin limitations set forth in claims 2 and 11 under Petitioner's second proposed construction (i.e., as referring to fin dimensions of the final FinFET devices *after* removing the portion of the first semiconductor fin) then under this construction, Chau in combination with Yu render claims 2, 5, 8, 11, and 15 obvious. *See* Pet. 65–77. Patent Owner does not make any

additional arguments directed specifically to these claims. *See* PO Resp. 57–58 (arguing claims 2, 5, 8, and 11 would not have been obvious over Chau and Yu for the same reasons the claims are not anticipated by either Chau or Yu); *see also id.* at 41 n.5 (asserting claim 15 would not have been obvious over Chau and Yu for the same because claim 13 is not anticipated by Chau). For the reasons set forth below, we conclude Petitioner makes a sufficient showing that claims 2, 5, 8, 11, and 15 are unpatentable as they would have been obvious over Chau and Yu.

1. Claims 2, 5, 8, and 11

As noted above in Section II.C.1, we construed claims 2 and 11 broadly as encompassing both the first and second constructions. Additionally, as noted above in Sections II.D and II.F, we determined claims 2, 5, 8, and 11 are anticipated by Yu and that claims 2, 5, and 11 are anticipated by Chau. Accordingly, based on those findings and because Patent Owner does not raise additional arguments directed to those claims aside from those raised in the context of Petitioner's anticipation challenges, we also conclude that claims 2, 5, 8, and 11 would have been obvious over the combination of Chau and Yu.

2. Claim 15

Claim 15 depends from claim 13 and further recites "wherein the first channel width is larger than the second channel width." Ex. 1001, 10:9–10. Petitioner admits that Chau does not specify that the first channel width is larger than the second channel width, but contends that Yu teaches this missing limitation. *See* Pet. 74. Specifically, Petitioner asserts that Yu teaches providing different FinFET devices with different fin aspect ratios (i.e., the ratio of the height to the width of a fin) and that these different fin

aspect ratios may be used to adjust the overall carrier mobilities of the FinFET devices. *Id.* (citing Ex. 1003 ¶¶ 6, 8, 9, 23). For example, Petitioner asserts Yu teaches that adjusting the fin aspect ratios of devices 710 and 720 may permit a different channel width ratio (e.g., 3:2) while keeping the pre-existing relationship between the drive currents of devices 710 and 720. *Id.* at 75.

Petitioner further asserts that a POSITA would have been motivated to combine Yu's teaching of varying the fin aspect ratio in order to adjust carrier mobility of Chau to achieve a desired overall carrier mobility of FinFET devices. *See* Pet. 67–68, 77 (citing Ex. 1002 ¶¶ 178–183).

Patent Owner does not make any arguments directed specifically to claim 15. *See* PO Resp. 41–42 n.5, 57–58 (asserting claim 15 is patentable because claim 13 is patentable). We find Petitioner makes a sufficient showing that the combination of Chau and Yu teaches each of the limitations of claim 15 and Petitioner provides sufficient reasoning with rational underpinning for combining the teachings of Chau and Yu.

Based on the complete record, we conclude that Petitioner shows by a preponderance of the evidence that claim 15 is unpatentable under 35 U.S.C. § 103(a) as it would have been obvious over the combination of Chau and Yu.

H. Patent Owner's Constitutionality Arguments

Patent Owner contends cancelling claims in this proceeding would contravene the Appoints Clause of the U.S. Constitution as *inter partes* review is unconstitutional when conducted by administrative patent judges not nominated by the President and confirmed by the Senate. PO Resp. 61. Patent Owner also argues that it is "unconstitutional to retroactively apply

inter partes review to the '303 patent, which issued in 2006, long prior to the enactment of the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011)." *Id.*

We decline to consider these constitutional challenges as Patent Owner fails to present sufficiently its arguments, and they have been addressed by intervening Federal Circuit authority in *Celgene Corp. v. Peter*, 931 F.3d 1542 (Fed. Cir. 2019) and *Arthrex, Inc. v. Smith & Nephew, Inc.*, No. 2018-2140 (Fed. Cir. Oct. 31, 2019).

III. CONCLUSION[4]

Based on the evidence and arguments, we determine that Petitioner has established by a preponderance of the evidence that claims 1–6, 8–11, and 18 are unpatentable under 35 U.S.C. § 102(b) by Yu, that claim 7 is unpatentable under 35 U.S.C. § 103(a) over the combination of Yu and Brask, that claims 1–7, 9–11, 13, 14, and 16 are unpatentable under § 102 by Chau, and that claims 2, 5, 8, 11, and 15 are unpatentable under § 103(a) over the combination of Chau and Yu.

IV. ORDER

In consideration of the foregoing, it is hereby:

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[4] Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding.* *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

ORDERED that claims 1–11, 13–16, and 18 of the ’303 patent are determined to be unpatentable; and

FURTHER ORDERED that, because this Decision is final, a party to the proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

In summary:

Claim(s)	**35 U.S.C. §**	**Reference(s)**	**Claim(s) Shown Unpatentable**	**Claims Not Shown Unpatentable**
1–6, 8–11, 18	§ 102	Yu	1–6, 8–11, 18	
7	§ 103	Yu, Brask	7	
1–7, 9–11, 13, 14, 16	§ 102	Chau	1–7, 9–11, 13, 14, 16	
2, 5, 8, 11, 15	§ 103	Chau, Yu	2, 5, 8, 11, 15	
Overall Outcome			1–11, 13–16, 18	

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EXHIBIT 10

IN THE UNITED STATES DISTRICT COURT00
FOR THE DISTRICT OF DELAWARE

SENSORMATIC ELECTRONICS, LLC, Plaintiff, v. WYZE LABS, INC., Defendant.	Civil Action No. 19-1543-CFC

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MEMORANDUM OPINION

September 3, 2020
Wilmington, Delaware

COLM F. CONNOLLY
UNITED STATES DISTRICT JUDGE

Plaintiff Sensormatic Electronics, LLC has sued Defendant Wyze Labs, Inc. for infringement of U.S. Patent Nos. 7,954,129 (the #129 patent); 7,730,534 (the #534 patent); 7,936,370 (the #370 patent); 8,208,019 (the #019 patent); and 8,610,772 (the #772 patent). D.I. 1.[1] Pending before me is Wyze's motion for judgment on the pleadings under Federal Rule of Civil Procedure 12(c). D.I. 21. Wyze asserts that I should grant judgment in its favor because the asserted patents are invalid under 35 U.S.C. § 101 for failing to claim patentable subject matter.

I. BACKGROUND[2]

The asserted patents are directed to wireless surveillance systems for monitoring a target environment and methods of operating such systems. D.I. 24 at 3; #129 patent at Abstract ("A surveillance system and method for remote viewing of inputs associated with at least one wireless input capture device ICD(s) monitoring a target environment . . . ."); #534 patent at Abstract ("A wireless surveillance system and methods of operating same . . . ."); #370 patent at Abstract

[1] Sensormatic's Complaint also alleged infringement of U.S. Patent Nos. 8,610,772 and 9,407,877, but Sensormatic is no longer asserting those patents. D.I. 67 at 2.
[2] When assessing the merits of a Rule 12(c) motion for judgment on the pleadings, I accept as true all factual allegations in the pleadings and view those facts in the light most favorable to the Plaintiff. *See Zimmerman v. Corbett*, 873 F.3d 414, 417–18 (3d Cir. 2017) (citations omitted).

("A surveillance system and method . . . providing a secure surveillance system having wireless communication for monitoring a target environment with optimized remote viewing); #019 patent at Abstract ("A surveillance system and method with wireless communication between components . . . for monitoring a target environment."); #772 patent at Abstract ("A surveillance system and method . . . providing a secure surveillance system having wireless communication for monitoring a target environment with prioritization capabilities."). The asserted patents each explain that "[w]hile video surveillance systems . . . existed in the prior art, typically they [we]re wired devices that are difficult, time-consuming, and costly to install and operate." #129 patent at 1:31–33; #534 patent at 1:60–62; #370 patent at 1:33–35; #019 patent at 1:29–31; #772 patent at 1:56–58. To solve such problems with wired surveillance systems, the patents disclose "wireless surveillance system[s]" with certain characteristics. *See* #129 patent at 4:37–38 ("The present invention is directed to a wireless surveillance system and methods of operating same . . . ."); #370 patent at 4:29–30 (same); #019 patent at 4:26–27 (same); #772 patent at 4:53–54 (same); #534 patent at 2:15–16 ("The present invention provides a wireless surveillance system and method of operating same . . . .").

Claim 14 of the #129 patent recites:

> 14. A surveillance system for wireless communication between components comprising:

> a base system including at least two wireless input capture devices (ICDs), the ICDs having at least one sensor and at least one input component for detecting and recording inputs, a processor, a memory, a transmitter/receiver, all constructed and configured in electronic connection;
>
> wherein the ICDs are operable for direct wireless cross-communication with each other without requiring interaction with a remote server computer for operation;
>
> and wherein the ICDs are operable for direct wireless communication with a remote viewing device operable by an authorized user.

Claim 14 thus recites a surveillance system that comprises at least two wireless devices that capture inputs about a target environment and that can communicate directly with each other and with a remote viewing device operated by an authorized user.

The remaining independent claims of the asserted patents recite wireless surveillance systems with the same features recited in claim 14. But one or more of the remaining independent claims also recites one or more of the following additional components: a "digital input recorder" that receives, records, edits, and/or stores data inputs from the input capture devices, *see, e.g.*, #129 patent at claim 1, a "remote server computer" that the user uses to interface with the system remotely, *see, e.g.*, #534 patent at claim 1, and a "digital video management and/or recording device" that stores and takes action on data received from the input

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capture devices, *see, e.g.*, *id.* And, one or more of the remaining independent claims also recites one or more of the following functions: "dual encoding"—i.e., converting—of system inputs from the input capture devices into multiple formats, *see, e.g.*, #370 patent at claim 1, activating the surveillance system remotely, *see, e.g.*, #534 patent at claim 1, activating the surveillance system automatically with a "single click-select command," *see, e.g.*, #772 patent at claim 1, "automatically detecting" a predefined "trigger event" that occurs at any of the input capture devices, *see, e.g.*, #019 patent at claim 1, and "image tagging or flagging based upon the occurrence of a trigger event," *see, e.g.*, *id.*

II. LEGAL STANDARDS

A. Motion for Judgment on the Pleadings

"The purpose of judgment on the pleadings is to dispose of claims where the material facts are undisputed and judgment can be entered on the competing pleadings and exhibits thereto, and documents incorporated by reference." *Int'l Bus. Machines Corp. v. Groupon, Inc.*, 289 F. Supp. 3d 596, 600 (D. Del. 2017) (citations omitted). "A motion for judgment on the pleadings should be granted if the movant establishes that there are no material issues of fact, and [the movant] is entitled to judgment as a matter of law." *Zimmerman v. Corbett*, 873 F.3d 414, 417 (3d Cir. 2017) (internal quotation marks and citations omitted). "In considering a motion for judgment on the pleadings, a court must accept all of the

allegations in the pleadings of the party against whom the motion is addressed as true and draw all reasonable inferences in favor of the non-moving party." *Id.* at 417–18 (citations omitted).

B. Patent-Eligible Subject Matter

Section 101 of the Patent Act defines patent-eligible subject matter. It provides: "Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title." 35 U.S.C. § 101.

There are three judicially created limitations on the literal words of § 101. The Supreme Court has long held that laws of nature, natural phenomena, and abstract ideas are not patentable subject matter. *Alice Corp. Pty. v. CLS Bank Int'l*, 573 U.S. 208, 216 (2014). These exceptions to patentable subject matter arise from the concern that the monopolization of "the[se] basic tools of scientific and technological work" "might tend to impede innovation more than it would tend to promote it." *Id.* (internal quotation marks and citations omitted).

"[A]n invention is not rendered ineligible for patent [protection] simply because it involves an abstract concept." *Id.* at 217. "Applications of such concepts to a new and useful end . . . remain eligible for patent protection." *Id.* (internal quotation marks, alterations, and citations omitted). But "to transform an

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unpatentable law of nature [or abstract idea] into a patent-eligible application of such a law [or abstract idea], one must do more than simply state the law of nature [or abstract idea] while adding the words 'apply it.'" *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 72 (2012) (emphasis removed).

In *Alice*, the Supreme Court established a two-step framework by which courts are to distinguish patents that claim eligible subject matter under § 101 from patents that do not claim eligible subject matter under § 101. The court must first determine whether the patent's claims are drawn to a patent-ineligible concept—i.e., are the claims directed to a law of nature, natural phenomenon, or abstract idea? *Alice*, 573 U.S. at 217. If the answer to this question is no, then the patent is not invalid for teaching ineligible subject matter. If the answer to this question is yes, then the court must proceed to step two, where it considers "the elements of each claim both individually and as an ordered combination" to determine if there is an "inventive concept—*i.e.*, an element or combination of elements that is sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the [ineligible concept] itself." *Id.* at 217–18 (alteration in original) (internal quotations and citations omitted).

III. DISCUSSION

I find that the asserted patents in this case are invalid under § 101 because they are directed to the abstract ideas of wireless communication and remote

surveillance and they do not contain an inventive concept.

A. *Alice* Step One

Starting at step one of the *Alice* analysis, I agree with Wyze that the asserted patents are directed to the abstract ideas of wireless communication and remote surveillance.[3]

First, the asserted patents' disclosure of wireless surveillance systems is directed to the abstract idea of communicating information wirelessly. The asserted patents are similar to a patent that the Federal Circuit invalidated in *Chamberlain Group, Inc. v. Techtronic Industries Co.*, 935 F.3d 1341 (Fed. Cir. 2019). The asserted patent in *Chamberlain* was directed to the abstract idea of "wirelessly communicating status information about a system" because, the Federal Circuit explained, "[t]he only described difference between the prior art . . . systems and the claimed . . . system [wa]s that the status information about the system [wa]s communicated wirelessly, in order to overcome certain undesirable disadvantages of systems using physical signal paths." *Id.* at 1346. Similarly here,

[3] Courts often invalidate patents that are directed to a combination of abstract ideas. *See, e.g.*, *FairWarning IP, LLC v. Iatric Sys., Inc.*, 839 F.3d 1089, 1094–95 (Fed. Cir. 2016) ("Here, the claims are directed to a combination of these abstract-idea categories."); *Control v. Digital Playground, Inc.*, 2016 WL 5793745, at *5 (S.D.N.Y. Sept. 30, 2016) ("[T]he concepts of remote surveillance, remote control, and the recording and transmission of audio and video and other data are clearly 'longstanding commercial practice[s].' Simply combining these abstract ideas does not create a non-abstract idea." (citation omitted)).

the asserted patents' written descriptions explain that the claimed systems and methods take the prior art wired video surveillance systems and make them wireless to avoid the disadvantages of wired systems. #129 patent at 1:31–33; #534 patent at 1:60–62; #370 patent at 1:33–35; #019 patent at 1:29–31; #772 patent at 1:56–58.

Sensormatic asserts that the patents are not directed to the abstract idea of wireless communication because the asserted patents are directed to direct wireless communication (i.e., device-to-device wireless communication) as opposed to indirect wireless communication (i.e., wireless communication through a server). D.I. 24 at 11–12. I disagree. The Federal Circuit held in *Chamberlain* that "the broad concept of communicating information wirelessly, without more, is an abstract idea" without distinguishing indirect from direct wireless communication. 935 F.3d at 1347. Moreover, like indirect wireless communication, direct wireless communication merely takes information previously transmitted via a wire and transmits that information wirelessly. And both direct and indirect wireless communication were basic conventional forms of communication at the time of the invention. #129 patent at 1:52–58, 2:50–3:3. "[T]hat the claimed invention transmits data wirelessly and therefore does not rely on a wired path is . . . simply a feature of wireless communication, which . . . was already a basic, conventional form of communication." *Chamberlain*, 935 F.3d at 1347. Sensormatic's claimed

systems and methods do not improve direct wireless communication or apply direct wireless communication in a new way and thus they are directed to the abstract idea of wireless communication.

Second, the asserted patents' disclosure of wireless surveillance systems for monitoring a target environment is also drawn to the abstract idea of remote surveillance—that is, monitoring an environment for security or control purposes by collecting and analyzing data about the environment. Monitoring activity for security or control purposes is a "longstanding" and "fundamental" human activity that falls "squarely within the realm of abstract ideas." *Alice*, 573 U.S. at 220–21. "[T]he general concept of keeping watch over property is timeless. As early as 31 BC, for example, the Romans monitored and secured their empire through numerous watchtowers, which could communicate through a signaling system." *Joao Control & Monitoring Sys., LLC v. Telular Corp.*, 173 F. Supp. 3d 717, 727 (N.D. Ill. 2016) (citing P. Southern, *Signals versus Illumination on Roman Frontiers*, 21 Britannia, 233–42 (1990)). Moreover, the asserted patents are similar to patents that the Federal Circuit invalidated in *FairWarning IP, LLC v. Iatric Systems, Inc.*, 839 F.3d 1089 (Fed. Cir. 2016). The patents in *FairWarning IP* were directed to the abstract idea of "collecting and analyzing information to detect misuse and notifying a user when misuse is detected." *Id.* at 1094. Here, the asserted patents teach collecting and analyzing information about a target

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environment for remote surveillance purposes. *See* #534 patent at claim 1 (reciting an input capture device that "captur[es] data input from activities within a target environment"); #129 patent at claim 1 (reciting "a data processor" that receives and records data inputs from the input capture devices); #019 patent at claim 1 (reciting "wherein the direct cross-communication of ICDs includes data exchange [of] information about the surveillance environment"); #772 patent at Abstract (reciting a system "providing for input capture and data transmission thereby providing a secure surveillance system").

Sensormatic asserts that "the claimed inventions are directed not just to wireless communication and surveillance generally, but more specifically to providing system capture devices that can communicate with each other, simplifying set-up and control of surveillance systems, allowing for comparison of data inputs from multiple, remotely-located input devices, and securing the storage and transmission of data for the system's input devices." D.I. 24 at 10–11 (citations omitted).

Those four functions, however, are merely features or results of the claimed abstract concepts of wireless communication and remote surveillance and thus they do not take the asserted patents beyond those concepts. *See Chamberlain*, 935 F.3d at 1347 (holding that a limitation did not take an invention beyond an abstract idea because the limitation "[wa]s not itself a technological improvement, but

rather simply a feature of [the abstract idea]"); *Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1356 (Fed. Cir. 2016) ("[T]he essentially result-focused, functional character of claim language has been a frequent feature of claims held ineligible under § 101."). First, the function of "providing system capture devices that can communicate with each other" is merely the application of the abstract idea of direct wireless communication—i.e., the function of providing generic devices that communicate directly with each other wirelessly. Second, the function of "simplifying set-up and control of surveillance systems" is a result of the abstract idea of direct wireless communication. Finally, the functions of "allowing for comparison of data inputs from multiple remotely-located input devices" and "securing the storage and transmission of data for the systems' input devices" are just features of the abstract idea of remote surveillance—i.e., collecting and analyzing data regarding the environment being surveilled.

Finally, the remaining claim limitations recited in the asserted patents also do not take the patents beyond the claimed abstract ideas. Similar to the functions that Sensormatic cites, the remaining limitations are merely features of the abstract ideas of wireless communication and remote surveillance; they also constitute abstract ideas themselves. For example, the limitation reciting "image tagging or flagging based upon the occurrence of a trigger event," #019 patent at claims 1, 2, 7, is an implementation of the abstract idea of remote surveillance; it is also

directed to "the abstract idea of classifying and storing digital images in an organized manner," *In re TLI Commc'ns LLC Patent Litig.*, 823 F.3d 607, 611 (Fed. Cir. 2016). The #019 patent's written description explains that the "image tagging or flagging" based on a "trigger event" can "mark the start of a subset of the input captured by the [input capture device]s and/or stored by the DIR for facilitating analysis and review at a later time." #019 patent at 15:56–59. In other words, when a certain triggering event occurs, the claimed system will record and organize the images and data surrounding the event. That function is a typical feature of a surveillance system, and it amounts to nothing more than the abstract idea of classifying and organizing images by tagging them and storing them.

The claimed "dual encoding of system inputs" in claim 1 of the#370 patent is drawn to the abstract idea of translating information between different formats. *See Novo Transforma Techs., LLC v. Sprint Spectrum L.P.*, 2015 WL 5156526, at *2 (D. Del. Sept. 2, 2015), *aff'd,* 669 F. App'x 555 (Fed. Cir. 2016) (invalidating claims directed to the abstract idea of "translation"). The #370 patent recites a wireless surveillance method that includes a step of "dual encoding" inputs in one format into multiple different formats. #370 patent at claim 1, 15:43–44. Dual encoding between formats on a computer is just the application of the abstract idea of translating on a computer. Sensormatic asserts that the dual encoding function is not abstract because it does not merely translate from one format to another;

instead, it converts a single input into multiple distinct formats. D.I. 24 at 13–14. Converting an input into multiple formats as opposed to a single format, however, is nothing more than translating.

The intrinsic record thus establishes that the asserted patents are directed to the abstract ideas of wireless communication and remote surveillance and none of the claim limitations take the claims beyond those abstract ideas.

B. *Alice* Step Two

Turning, then, to the second step of the *Alice* analysis, the question is whether the asserted patents claim an inventive concept sufficient to ensure that the patent in practice teaches significantly more than mere wireless communication and remote surveillance. In *Alice*, the Court considered at step two "the introduction of a computer into the claims" and held that "the mere recitation of a generic computer [in the claims] cannot transform a patent-ineligible abstract idea into a patent-eligible invention." 573 U.S. at 222–23.[4] Thus, the use of "a generic

[4] The Federal Circuit has at times considered computer functionality at step one of the *Alice* inquiry and at times at step two. *Compare Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1335 (Fed. Cir. 2016) ("Therefore, we find it relevant to ask whether the claims are directed to an improvement to computer functionality versus being directed to an abstract idea, even at the first step of the *Alice* analysis."), *Cellspin Soft, Inc. v. Fitbit, Inc.*, 927 F.3d 1306, 1315–16 (Fed. Cir. 2019) (considering introduction of computer functionality into claims at step one of *Alice* inquiry), *and TLI Commc'ns*, 823 F.3d at 611–13 (same), *with Trading Techs. Int'l, Inc. v. IBG LLC*, 921 F.3d 1084, 1094 (Fed. Cir. 2019) (considering whether the claims "improve computer functionality" at step two), *Intellectual Ventures I*, 838 F.3d at 1320 (considering whether "the asserted claim improve[s]

computer to perform generic computer functions" does not provide the requisite inventive concept to satisfy step two of the *Alice* analysis. *Id.* at 225.

In this case, the asserted patents merely perform the abstract concepts of wireless communication and remote surveillance using generic computer functionalities; and they therefore fail *Alice*'s step two inquiry. The claimed wireless surveillance systems and methods consist of components such as input capture devices, remote server computers, digital input recorders (DIRs), remote viewing devices, and digital video management devices. *See, e.g.*, #129 patent at claim 1; #534 patent at claim 1. And those components are described in the asserted patents as off-the-shelf, pre-existing computer components that Sensormatic does not claim to have invented. #129 patent at 9:7–14 ("Preferred embodiments of a system according to the present invention includes video technology commercially provided by PIXIM."); *id.* at 13:50–53 ("[T]he RSC is thus any Internet connectable device including computer, PDA, cell phone . . . ."); *id.* at 10:42–43 ("[T]he DIR may also be referred to as a digital video recorder device (DVR)."). The patents also describe those components as performing

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or change[s] the way a computer functions" at step two), *and Bascom Glob. Internet Servs., Inc. v. AT&T Mobility LLC*, 827 F.3d 1341, 1351 (Fed. Cir. 2016) (finding that "the claims may be read to improve an existing technological process" at step two (internal quotation marks and alteration omitted)). I will follow the Supreme Court's lead in *Alice* and consider computer functionality at step two.

nothing more than conventional computer functions. *See id.* at 6:59–61 (describing the wireless input capture device as performing the conventional computer functions of "sensing, capturing, and transmitting surveillance inputs"); *id.* at 5:15–17 (describing the digital input receiver as performing the conventional computer functions of "receiving, storing, editing, and/or retrieving stored input" from the ICD); *see also* #534 patent at 3:17–20, 3:43–45, 5:15–18.

Sensormatic argues that the claimed input capture device "is not just any generic component—it must contain a number of specific features and be capable of performing a number of functions in order to fall within the scope of the patents' claims." D.I. 24 at 16. Sensormatic, however, does not define those "specific features" of the input capture device. The sections of the written description cited by Sensormatic describe the input capture device and the components of the input capture device —i.e., a sensor, an input component, a processor, memory, and a transmitter/receiver—as generic or commercially-available features. #129 patent at 7:14–24, 8:65–9:14. And the combination of those generic components does not constitute an inventive concept. Sensormatic also notes that the input capture device must "be capable of cross-communication . . . and two-way wireless communication with other devices." D.I. 24 at 16. Those capabilities, however, are just subsets of the abstract idea of wireless communication and thus they do not take the invention beyond the abstract idea.

Sensormatic also asserts that Wyze "fails to account for a large number of claim elements (either in isolation or in combination) that may provide an inventive concept." D.I. 24 at 18. The only elements that Sensormatic identifies, however, are the claimed "direct cross-communication," "automatic detection of trigger events," "automatic remote activation," "dual encoding," and "single-click select" functionalities. D.I. 24 at 17, 18–19. Wyze *did* address those claim elements and I agree with Wyze that those elements merely implement abstract ideas using generic components.

First, direct cross-communication is a subset of direct wireless communication and does not constitute an inventive concept. It is undisputed that direct wireless communication was a conventional form of wireless communication at the time of the invention and the asserted patents do not purport to improve how direct wireless communication is accomplished or apply the concept of direct wireless communication in a new way. Instead, the asserted patents implement direct wireless communication using pre-existing, commercial "protocols" such as Bluetooth and other generic components. *See* #534 patent at 3:14–17 ("The ICD transmits the data wirelessly (using network protocols such as 802.11, cell phone protocols such as CDMA or GSM, or any other wireless protocol such as Zigbee, Bluetooth, or other) to a DVM . . . .").

Second, the "automatic detection of trigger events" claim limitation, #019

patent at claims 1, 2, is a feature of the abstract idea of remote surveillance and the mere automation and distribution of event detection using generic components does not provide an inventive step. *See Univ. of Fla. Research Found., Inc. v. Gen. Elec. Co.*, 916 F.3d 1363, 1367 (Fed. Cir. 2019) (holding that automating an abstract idea "does not render it any less abstract"). The patent does not explain how the automatic detection at multiple locations is achieved beyond the use of generic components.

Third, the automatic remote activation limitation only adds to the claimed wireless surveillance systems the conventional step of automatically activating the system with a remote computer. *See* #534 patent at claim 1 (reciting "automatically activating the system based on inputs provided through a user interface on a remote computer"). The asserted patents do not explain how the remote activation is performed beyond the use of generic computer components.

Fourth, the #370 patent's dual encoding limitation does nothing more than add the abstract idea of translation to the wireless surveillance systems using generic components. The #370 patent does not claim to have invented a new or improved method of encoding inputs into multiple formats; nor does it describe any specialized technology to perform dual encoding. The written description explains that the "dual encoding software run[s] on an embedded DSP chip or a computer" and "encodes inputs captured by the [input capture device](s) in

multiple formats simultaneously." #370 patent at 15:41–44. The asserted patents never specify the form of the embedded DSP chip or computer; they are just conventional computer components that implement abstract ideas.

Finally, the #772 patent's claimed "single click-select command" activation functionality, #772 patent at claims 1–9, 14–17, does nothing more than add to the claimed wireless surveillance systems the function of activating the system by "selecting" an item on a graphical user interface using a mouse click. That function is a well-known computer functionality and the patents do not describe anything unique such as specialized hardware or software that would make this feature non-conventional. *See Trading Techs. Int'l*, 921 F.3d at 1093 ("[S]electing . . . an icon is [a] well-understood, routine, conventional activity.").[5]

Considered individually and as an ordered combination, therefore, the claim elements of the asserted patents teach nothing more than the performance of "well-understood, routine, and conventional activities previously known to the industry."

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[5] Sensormatic asserts that "[t]he patents themselves note that the capability for single click activation was a 'surprising[]' advancement over the prior art. D.I. 24 at 17 (citing #772 patent at 10:57–11:13). The "surprising[]" that Sensormatic cites, however, refers to the ability of the "DIR device [to] function[] as an appliance"—not to the single click-select command activation. *See* #772 patent at 10:57–61. Sensormatic does not argue that the ability of the DIR to function as an appliance is an inventive concept. And for good reason. The DIR is a generic component of the claimed systems and methods and the patentee does not purport to have invented DIR's ability to act as an appliance; nor does the patent even explain what causes DIR to act as an appliance. *See* #772 patent at 10:49–61.

Alice, 573 U.S. at 225 (internal quotation marks and citation omitted). The claimed wireless surveillance systems and methods do not improve how the abstract ideas of wireless communication and remote surveillance are accomplished or apply those concepts in a new way; the systems and methods merely implement the abstract ideas of wireless communication and remote surveillance using well-known, generic computer components and functionalities.

Because the asserted patents are directed to abstract ideas and do not contain an inventive concept, the asserted patents are invalid for failing to claim patentable subject matter under § 101.[6]

IV. CONCLUSION

For the foregoing reasons, I will grant Sensormatic's motion for judgment on the pleadings for patent invalidity under § 101. D.I. 21.

The Court will issue an Order consistent with this Memorandum Opinion.

[6] Sensormatic argues that "[a]t a minimum, claim construction is required before any decision on patentability can be reached." D.I. 24 at 21. But Sensormatic never identified a claim construction issue that required resolution before I could rule on the present motion; and tellingly, Sensormatic stated in connection with claim construction briefing that "no claim term(s)/phrase(s)" require construction. D.I. 60, Ex. A at 1.

EXHIBIT 11

IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF DELAWARE

UNIVERSAL SECURE REGISTRY LLC,

Plaintiff,

v.

APPLE INC., VISA INC., and VISA U.S.A., INC.,

Defendants.

Civ. No. 17-585-CFC-SRF

Jack B. Blumenfeld and Jeremy A. Tigan, Morris, Nichols, Arsht & Tunnell LLP, Wilmington, DE. Harold Barza, Tigran Guledjian, Valerie Roddy, and Jordan Kaericher, Quinn Emanuel Urquhart & Sullivan, LLP, Los Angeles, CA. Sean Pak and Brian E. Mack, Quinn Emanuel Urquhart & Sullivan, LLP, San Francisco, CA. *Attorneys for Universal Secure Registry LLC.*

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MEMORANDUM OPINION

June 30, 2020
Wilmington, Delaware

Colm F. Connolly

CONNOLLY, UNITED STATES DISTRICT JUDGE

Plaintiff Universal Secure Registry LLC (USR) has sued Defendants Apple Inc., Visa Inc., and Visa U.S.A., Inc. for infringement of U.S. Patent Nos. 8,856,539 (the #539 patent), 9,100,826 (the #826 patent), 8,577,813 (the #813 patent), and 9,530,137 (the #137 patent). Defendants moved to dismiss the Complaint pursuant to Federal Rule of Civil Procedure 12(b)(6) on the grounds that the asserted patents claim unpatentable subject matter and are therefore invalid under 35 U.S.C. § 101. D.I. 16. In a Report and Recommendation issued pursuant to 28 U.S.C. § 636(b), the Magistrate Judge recommended that I deny Defendants' motion. D.I. 137.

Pending before me are Defendants' objections to the Magistrate Judge's recommendation. D.I. 147. I have studied the Report and Recommendation, the objections, Plaintiff's response to the objections, D.I. 150, and the parties' briefs filed in support and opposition to the underlying motions, D.I. 17, D.I. 30, D.I. 37. I review the Magistrate Judge's recommendation de novo. § 636(b)(1); Fed. R. Civ. P. 72(b)(3).

I. BACKGROUND

The four asserted patents are directed to the secure authentication (i.e., verification) of a person's identity. In the words of the Complaint: "USR's patented innovations allow a user to securely authenticate his or her identity using

technology built into a personal electronic device combined with the user's own secret and/or biometric information." D.I. 1 ¶ 21.

USR alleged in the Complaint that each patent has an "exemplary" claim. D.I. 1 ¶¶ 43, 65, 84, 106. Exemplary claim 22 of the #539 patent provides:

> A method for providing information to a provider to enable transactions between the provider and entities who have secure data stored in a secure registry in which each entity is identified by a time-varying multi character code, the method comprising:
>
> receiving a transaction request including at least the time varying multicharacter code for an entity on whose behalf a transaction is to take place and an indication of the provider requesting the transaction;
>
> mapping the time-varying multicharacter code to an identity of the entity using the time-varying multicharacter code;
>
> determining compliance with any access restrictions for the provider to secure data of the entity for completing the transaction based at least in part on the indication of the provider and the time-varying multicharacter code of the transaction request;
>
> accessing information of the entity required to perform the transaction based on the determined compliance with any access restrictions for the provider, the information including account identifying information;
>
> providing the account identifying information to a third party without providing the account identifying information to the provider to enable or deny the transaction; and
>
> enabling or denying the provider to perform the transaction without the provider's knowledge of the account identifying information.

#539 patent at 20:4-31.

Exemplary claim 10 of the #826 patent provides:

A computer implemented method of authenticating an identity of a first entity, comprising acts of:

authenticating, with a first handheld device, a user of the first handheld device as the first entity based on authentication information;

retrieving or receiving first biometric information of the user of the first handheld device;

determining a first authentication information from the first biometric information;

receiving with a second device, the first authentication information of the first entity wirelessly transmitted from the first handheld device;

retrieving or receiving respective second authentication information for the user of the first handheld device; and

authenticating the identity of the first entity based upon the first authentication information and the second authentication information.

#826 patent at 45:30-47.

Exemplary claim 1 of the #813 patent, which has been reformatted for clarity, provides:

An electronic ID device configured to allow a user to select any one of a plurality of accounts associated with the user to employ in a financial transaction, comprising:

a biometric sensor configured to receive a biometric input provided by the user;

a user interface configured to receive a user input including secret information known to the user and identifying information concerning an account selected by the user from the plurality of accounts;

a communication interface configured to communicate with a secure registry;

a processor coupled to the biometric sensor to receive information concerning the biometric input, the user interface and the communication interface,

the processor being programmed to activate the electronic ID device based on successful authentication by the electronic ID device of at least one of the biometric input and the secret information,

the processor also being programmed such that once the electronic ID device is activated the processor is configured to generate a nonpredictable value and to generate encrypted authentication information from the nonpredictable value, information associated with at least a portion of the biometric input, and the secret information, and to communicate the encrypted authentication information via the communication interface to the secure registry; and

wherein the communication interface is configured to wirelessly transmit the encrypted authentication information to a point-of-sale (POS) device, and

wherein the secure registry is configured to receive at least a portion of the encrypted authentication information from the POS device.

#813 patent at 51:65-29.

Finally, exemplary claim 12 of the #137 patent provides:

A system for authenticating a user for enabling a transaction, the system comprising:

a first device including:

a biometric sensor configured to capture a first biometric information of the user;

a first processor programmed to: 1) authenticate a user of the first device based on secret information, 2) retrieve or receive first

> biometric information of the user of the first device, 3) authenticate the user of the first device based on the first biometric, and 4) generate one or more signals including first authentication information, an indicator of biometric authentication of the user of the first device, and a time varying value; and
>
> a first wireless transceiver coupled to the first processor and programmed to wirelessly transmit the one or more signals to a second device for processing;
>
> wherein generating the one or more signals occurs responsive to valid authentication of the first biometric information; and
>
> wherein the first processor is further programmed to receive an enablement signal indicating an approved transaction from the second device,
>
> wherein the enablement signal is provided from the second device based on acceptance of the indicator of biometric authentication and use of the first authentication information and use of second authentication information to enable the transaction.

#137 patent at 46:55-47:14.

Defendants argue that these exemplary claims are directed to an abstract idea and therefore claim unpatentable subject matter under § 101. The Magistrate Judge found that the patents are "not directed to an abstract idea because 'the plain focus of the claims is on an improvement to computer functionality, not on economic or other tasks for which a computer is used in its ordinary capacity.'" D.I. 137 at 18, 19, 21, 23 (quoting *Visual Memory LLC v. NVIDIA Corp.*, 867 F.3d 1253, 1258 (Fed. Cir. 2017)).

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II. LEGAL STANDARDS

A. Rule 12(b)(6)

To state a claim on which relief can be granted, a complaint must contain "a short and plain statement of the claim showing that the pleader is entitled to relief." Fed. R. Civ. P. 8(a)(2). Detailed factual allegations are not required, but the complaint must include more than mere "labels and conclusions" or "a formulaic recitation of the elements of a cause of action." *Bell Atl. Corp. v. Twombly*, 550 U.S. 544, 555 (2007) (citation omitted). The complaint must set forth enough facts, accepted as true, to "state a claim to relief that is plausible on its face." *Id.* at 570. A claim is facially plausible "when the plaintiff pleads factual content that allows the court to draw the reasonable inference that the defendant is liable for the misconduct alleged." *Ashcroft v. Iqbal*, 556 U.S. 662, 678 (2009) (citation omitted). Deciding whether a claim is plausible is a "context-specific task that requires the reviewing court to draw on its judicial experience and common sense." *Id.* at 679 (citation omitted).

B. Patent-Eligible Subject Matter

Section 101 of the Patent Act defines patent-eligible subject matter. It provides: "Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement

thereof, may obtain a patent therefor, subject to the conditions and requirements of this title." 35 U.S.C. § 101.

There are three judicially created limitations on the literal words of § 101. The Supreme Court has long held that laws of nature, natural phenomena, and abstract ideas are not patentable subject matter. *Alice Corp. Pty. v. CLS Bank Int'l*, 573 U.S. 208, 216 (2014). These exceptions to patentable subject matter arise from the concern that the monopolization of "the[se] basic tools of scientific and technological work" "might tend to impede innovation more than it would tend to promote it." *Id.* (internal quotation marks and citations omitted).

"[A]n invention is not rendered ineligible for patent [protection] simply because it involves an abstract concept." *Alice*, 573 U.S. at 217. "Applications of such concepts to a new and useful end . . . remain eligible for patent protection." *Id.* (internal quotation marks, alterations, and citations omitted). But "to transform an unpatentable law of nature [or abstract idea] into a patent-eligible application of such a law [or abstract idea], one must do more than simply state the law of nature [or abstract idea] while adding the words 'apply it.'" *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 72 (2012) (emphasis removed).

In *Alice*, the Supreme Court established a two-step framework by which courts are to distinguish patents that claim eligible subject matter under § 101 from patents that do not claim eligible subject matter under § 101. The court must first

determine whether the patent's claims are drawn to a patent-ineligible concept—i.e., are the claims directed to a law of nature, natural phenomenon, or abstract idea? *Alice*, 573 U.S. at 217. If the answer to this question is no, then the patent is not invalid for teaching ineligible subject matter. If the answer to this question is yes, then the court must proceed to step two, where it considers "the elements of each claim both individually and as an ordered combination" to determine if there is an "inventive concept—i.e., an element or combination of elements that is sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the [ineligible concept] itself." *Id.* at 217–18 (alteration in original) (internal quotations and citations omitted).

III. DISCUSSION

I agree with Defendants that the exemplary claims of the asserted patents do not recite patentable subject matter. The patents are directed to an abstract idea—the secure verification of a person's identity—and therefore fail step one of the *Alice* inquiry. And the patents do not disclose an inventive concept such as an improvement in computer functionality that transforms that abstract idea into a patent-eligible application of the idea.

The Magistrate Judge found that the patents are not directed to an abstract idea based on her finding that the asserted exemplary claims teach improvements in computer functionality. USR, however, has never argued that the patents

disclose improvements in computer technology; and, in my view, neither the patents' claims nor their written descriptions teach or purport to teach improvements in computer functionality. Moreover, contrary to USR's arguments, neither the patents nor their written descriptions disclose "concrete and useful improvements" to "technical challenges associated with digital security and authentication" that transform the subject matter of the claims patentable under § 101. D.I. 30 at 2–3.

A. Claim 22 of the #539 Patent

As its preamble acknowledges, claim 22 teaches "[a] method for providing information to a provider [typically, a merchant] to enable transactions between the provider and entities [typically, a customer of the merchant] who have secure data stored in a secure registry in which each entity is identified by a time-varying multicharacter code." In other words, it teaches a method to obtain the secure verification of a person's identity to enable a commercial transaction.

The #539 patent is not materially different from the patent at issue in *Prism Techs. LLC v. T-Mobile USA, Inc.*, 696 F. App'x 1014 (Fed. Cir. 2017). The Federal Circuit determined that the patent in *Prism Tech.* was invalid because it was directed to the abstract idea of "providing restricted access to resources." *Id.* at 1016–17. The claims of the patent in *Prism Tech.* taught "an abstract process" that included: "(1) receiving identity data from a device with a request for access to

resources; (2) confirming the authenticity of the identity data associated with that device; (3) determining whether the device identified is authorized to access the resources requested; and (4) if authorized, permitting access to the requested resources." *Id.* The #539 patent's authentication method closely parallels this abstract process. Claim 22 of the #539 patent teaches: (1) "receiving" a transaction request with a time-varying multicharacter code and "an indication of" the merchant requesting the transaction; (2) "mapping" the time-varying multicharacter code to the identity of the customer in question; (3) "determining" whether the merchant's access to the customer's secure data complies with any restrictions; (4) "accessing" the customer's account information; (5) "providing" the account identifying information to a third party without providing that information to the merchant; and (6) "enabling or denying" the merchant to perform the transaction without obtaining knowledge of the customer's identifying information. #539 patent at 20:4-32. Given the similarities between these six steps and the claimed process in *Prism Tech.*, I find that claim 22 is directed to the abstract idea of obtaining the secure verification of a user's identity to enable a transaction.

Turning to step two of the analysis, as the patent itself acknowledges, all of the steps to the claimed process are accomplished by implementing well-known methods using conventional computer components. *See* #539 patent at 5:63-66

("The computer system may be a general purpose computer ...."); 6:4-7:10 ("In a general purpose computer system, the processor is typically a commercially available microprocessor," "The database 24 may be any kind of database," etc.). The claimed process therefore fails step two. *See Alice*, 573 U.S. at 222–23, 225 (considering at step two "the introduction of a computer into the claims" and holding that the use of "a generic computer to perform generic computer functions" does not provide the requisite inventive concept to satisfy step two); *Prism Tech.*, 696 F. App'x at 1017-18 (holding that, "[v]iewed as an ordered combination, the asserted claims recite[d] no more than the sort of 'perfectly conventional' generic computer components employed in a customary manner" that did "not rise to the level of an inventive concept" and therefore did not "transform the abstract idea into a patent-eligible invention" under *Alice* step two).[1]

USR argues that the "key" to claim 22's innovation is "allow[ing] transaction approval ***without providing account identifying information to the merchant***." D.I. 30 at 19 (emphasis in original). But sending data to a third-party as opposed to the merchant is not a technological innovation, but rather a

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[1] I recognize that the Federal Circuit has on other occasions considered computer functionality as part of step one of the *Alice* inquiry. *See, e.g., Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1335–36 (Fed. Cir. 2016) (considering introduction of computer functionality into claims as part of step one of *Alice* inquiry); *see also In re TLI Commc'ns LLC Patent Litig.*, 823 F.3d 607, 611–13 (Fed. Cir. 2016) (same). Whether computer functionality is considered at step one or step two seems to me immaterial as long as it is considered at some point in the *Alice* analysis.

"insignificant post-solution activity" that is insufficient to confer patent eligibility. *Bilski v. Kappos*, 561 U.S. 593, 611 (2010).

USR also intimates that the use of a time-varying code provides an inventive concept. D.I. 30 at 19. But the claimed method employs the use of a time-varying code in a customary manner and in the naturally expected order of steps. *See Boom! Payments, Inc. v. Stripe, Inc.*, 2019 WL 6605314, at *1 (N.D. Cal. Nov. 19, 2019) (claims directed to "authenticating internet sales through use of a third party intermediary" lack an inventive concept where "[a] third-party server receives and stores the buyer's payment information," the server "generates and sends a transaction-specific code to the buyer," "the buyer sends the code to the seller," the seller "sends the code (and identifying information) to the server," and "[i]f the code is a match, the server processes the payment"); *Asghari-Kamrani v. United Serv. Auto. Ass'n*, 2016 WL 3670804, at *5–6 (E.D. Va. July 5, 2016) (claims verifying the identity of a participant to a transaction using a randomly generated code lack an inventive concept where the steps include (1) "receiving" a request for a dynamic code at a central entity; (2) "generating" a dynamic code by the central entity; (3) "providing" the generated dynamic code to the user; (4) "receiving" a request for authenticating the user from an external entity; and (5) "authenticating" by the central entity the user and providing the result to the external entity"); *Inventor Holdings, LLC v. Bed Bath & Beyond Inc.*, 123

F.Supp.3d 557, 562 (D. Del. 2015) (claim for processing a payment for a purchase of goods lacks an inventive concept where the steps include "(a) receiving a code relating to a purchase of goods; (b) determining if the code relates to a local or remote order; and (c) if the code is for a remote order, then determining the price, receiving payment, and alerting the remote seller that payment has been received").

B. Claim 10 of the #826 Patent

As with claim 1 of the #539 patent, the preamble of claim 10 of the #826 patent makes clear that claim 10's method is directed to the abstract idea of secured verification of a person's identity. The preamble reads: "[a] computer implemented method of authenticating an identity of a first entity[.]" #826 patent at 45:30-31. The six method steps disclosed in the remainder of claim 10 do not teach a technological solution but instead disclose an authentication method that is accomplished by retrieving and reviewing information, including biometric information, using a handheld device and a second device, to authenticate a user's identification.

USR argues that the claimed method is not abstract and teaches inventive "technological improvements over prior art systems" because it "include[es]: (1) gathering biometric information while locally authenticating the user, preventing unauthorized use of the device; and (2) requiring additional remote user authentication by a second device, based on both authentication information (e.g.,

one-time variable token) received from the first device, and second authentication information (e.g., information securely stored at the second device or obtained from the [Universal Secure Registry database])." D.I. 30 at 15. But the patent does not teach a technological solution for obtaining, generating, or analyzing biometric information, which the patent defines generically as "any . . . method of identifying the person possessing the device." #826 patent at 4:27–32. Nor does the patent teach any improvements to handheld or other devices or technological solutions that enable such devices and biometric information to be combined to authenticate a user's identity remotely. Rather, the patent teaches the routine use of biometric information, mobile devices, onetime variable tokens, and/or multiple devices to authenticate a person. That teaching is not inventive and does not make the claimed authentication method patentable under § 101. *See IQS US Inc. v. Calsoft Labs Inc.*, 2017 WL 3581162, at *5 (N.D. Ill. Aug. 18, 2017) (patent using generic functions of existing technology to verify identity based on biometric information lacked an inventive concept); *Intellectual Ventures I LLC v. Erie Indem. Co.*, 850 F.3d 1315, 1331 (Fed. Cir. 2017) (patent implementing mobile interface in generic manner to access user's data lacked an inventive concept); *Boom!*, 2019 WL 6605314, at *1 ("generat[ing] and send[ing] a transaction-specific code to the buyer" lacks an inventive concept because it is a generic computer function); *Asghari-Kamrani*, 2016 WL 3670804, at *5 ("generating a random code" is a "conventional computer

function[]" that lacks an inventive concept); *Smart Authentication IP, LLC v. Elec. Arts Inc.*, 402 F. Supp. 3d 842, 853 (N.D. Cal. 2019) ("Using well-known computer technology to authenticate a user – even using multiple electronic media to do so – amounts to functional use of familiar technology and is not inventive.").

C. Claim 1 of the #813 Patent

USR argues that the Electronic ID Device disclosed in claim 1 of the #813 patent "includes a biometric sensor, user interface, communication interface, and processor, all working together in a specific way to generate and transmit encrypted authentication information via a [point-of-sale] device to a secure registry." D.I. 30 at 5. But the patent does not disclose a specific technical solution by which such encrypted information is generated or transmitted. Rather, as USR states in its briefing, the patent merely discloses that "[t]he Electronic ID Device collects biometric information from the user, secret information known by the user, and account identifying information selected by the user to activate the device, and to generate a non-predicable value and the encrypted authentication information." *Id.* In other words, the device collects and examines data to authenticate the user's identity.

The patent describes the Electronic ID Device as "any type of electronic device" capable of accessing a secure identification system database, #813 patent at 13:5–8, and it describes the device as consisting of well-known, generic

components, including a computer processor, *see id.* at 5:30–34, 7:1–7, 27:25–29, 43:21–33, 50:3–11. Accordingly, it does not teach an inventive concept that transforms the abstract idea of authenticating identity into patentable subject matter. *See In re Gopalan*, 2020 WL 1845308, at *4 (Fed. Cir. Apr. 13, 2020) (holding that performing the steps of an abstract concept "on a generic processor does not transform it into a patentable apparatus").

D. Claim 12 of the #137 Patent

The preamble of claim 12 of the #137 patent states that the claim is directed to "[a] system for authenticating a user for enabling a transaction." #137 patent at 46:55-56. The system disclosed to accomplish this abstract task is comprised of generic components—a device, a biometric sensor, a processor, and a transceiver—performing routine functions—retrieving, receiving, sending, authenticating—in a customary order. *Prism Tech.*, 696 F. App'x at 1017; *Telesign Corp. v. Twilio, Inc.*, 2018 WL 10638619, at *2 (N.D. Cal. Oct. 19, 2018). Accordingly, it lacks the inventive concept necessary to convert the claimed system into patentable subject matter. *Alice*, 573 U.S. at 222–23, 225; *Prism Tech.*, 696 F. App'x at 1017-18.

IV. CONCLUSION

For the foregoing reasons, I will not adopt the recommendation of the Magistrate Judge and will instead grant Defendants' motion to dismiss the Complaint for failure to state a claim.

The Court will issue an Order consistent with this Memorandum Opinion.

EXHIBIT 12

Trials@uspto.gov
571-272-7822

Paper 35
Date: March 6, 2020

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

RIMFROST AS.,
Petitioner,

v.

AKER BIOMARINE ANTARCTIC AS.,
Patent Owner.

IPR2018-01730
Patent 9,072,752 B2

Before ERICA A. FRANKLIN, TINA E. HULSE, and
JOHN E. SCHNEIDER, *Administrative Patent Judges.*

SCHNEIDER, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
Denying Patent Owner's Motion to Amend
35 U.S.C. § 318(a)

I. INTRODUCTION

This is a Final Written Decision in an *inter partes* review challenging the patentability of claims 1–20 ("the challenged claims) of U.S. Patent 9,072,752 B2 ("the '752 patent," Ex. 1001). We have jurisdiction under 35 U.S.C. § 6, and enter this Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons set forth below, we determine that Rimfrost AS ("Petitioner") has shown, by a preponderance of the evidence, that the challenged claims are unpatentable. *See* 35 U.S.C. § 316(e) (2012). Additionally, we deny the contingent Motion to Amend filed by Aker Biomarine Antarctic AS ("Patent Owner").

A. Procedural History

Petitioner filed a petition for an *inter partes* review of the challenged claims under 35 U.S.C. § 311. Paper 2 ("Pet.") Petitioner supported the Petition with the Declaration of Stephen J. Tallon, Ph.D. (Ex. 1006). Patent Owner declined to file a Preliminary Response to the Petition.

On March 12, 2019, pursuant to 35 U.S.C. § 314(a), we instituted trial to determine whether any of the challenged claims are unpatentable on the grounds raised in the Petition. Paper 7 ("Inst. Dec.").

Patent Owner filed a Patent Owner Response to the Petition. Paper 13 ("PO Resp."). Patent Owner supported the Response with the Declaration of Nils Hoem, Ph.D. Ex. 2001. Petitioner filed a Reply to the Patent Owner Response. Paper 18. ("Pet. Reply"). Patent Owner filed a Sur-Reply to Petitioner's Reply. Paper 25 ("PO Sur-Reply").

Patent Owner filed a Contingent Motion to Amend. Paper 12 ("MTA"). Patent Owner supported the motion with the Reply Declaration of Nils Hoem, Ph.D. Ex. 2025. Petitioner filed an Opposition to the motion.

Paper 19 ("MTA Opp."). Petitioner supported the Opposition to the motion with the Reply and Opposition Declaration of Stephen J. Tallon, Ph.D. Ex. 1086. Patent Owner filed a Reply to Petitioner's Opposition to the Motion to Amend. Paper 24 ("MTA Reply"). Petitioner filed a Sur-Reply to Patent Owner's Reply to Opposition to Motion to Amend. Paper 31 ("MTA Sur-Reply").

On December 9, 2019, the parties presented arguments at an oral hearing. Paper 30. The hearing transcript has been entered in the record. Paper 34 ("Tr.").

B. Real Parties in Interest

Petitioner identifies its real parties in interest as Olympic Holding AS, Emerald Fisheries AS, Rimfrost USA, LLC, Rimfrost New Zealand Limited, Bioriginal Food and Science Corp., and Petitioner, Rimfrost AS. Pet. 1. Additionally, Petitioner asserts that, based upon a majority ownership interest in those entities, and in an abundance of caution, it also names Stig Remøy, SRR Invest AS, Rimfrost Holding AS, and Omega Protein Corporation as real parties in interest. *Id.* at 2. Patent Owner identifies its real party in interest as Aker BioMarine Antarctic AS. Paper 4, 1.

C. Related Matters

Petitioner and Patent Owner provide notice that two related patents, U.S. Patent Nos. 9,028,877 B2 ("the '877 patent") and 9,078,905 B2 ("the '905 patent"), have been asserted in *Aker Biomarine Antarctic AS v. Olympic Holding AS*, Case No. 1:16-CV-00035-LPS-CJB (D. Del.) (stayed). Pet. 2; Paper 4, 1. The parties note that U.S. Patent No. 9,375,453 ("the '453 patent") was asserted, along with related patents, including U.S. Patent No. 9,320,765 B2 ("the '765 patent"), in *In the Matter of Certain Krill Oil Products and Krill Meal for Production of Krill Oil Products*, Investigation

No. 337-TA-1019 (USITC). Pet. 2; Paper 4, 1. According to the parties, that matter has been "effectively terminated." Pet. 2; Paper 4, 1.

The Board has issued Final Written Decisions addressing challenges to claims of: (a) the '877 patent (IPR2017-00746, Paper 23, claims 1–19 shown to be unpatentable; IPR2017-00748, Paper 23, claims 1–19 not shown to be unpatentable); (b) the '905 patent (IPR2017-00745, Paper 24, claims 1–20 shown to be unpatentable; IPR2017-00747, Paper 24, claims 1–20 not shown to be unpatentable); (c) the '765 patent (IPR2018-00295, Paper 35, claims 1–48 shown to be unpatentable); (d) the '453 patent (IPR2018-01178, paper 34, claims 1–32 shown to be unpatentable). The Federal Circuit has affirmed the Board's determination that the challenged claims of the '877 patent and '905 patent would have been obvious based upon the grounds set forth in IPR2017-00746 and IPR2017-00745, respectively. *Aker Biomarine Antarctic AS v. Rimfrost AS*, 786 F. App'x 251 (Fed. Cir. Oct. 3, 2019).

D. The '752 Patent

The '752 patent, titled "Bioeffective Krill Oil Compositions" issued on July 7, 2015, from U.S. Patent Application No. 14/620,784 filed on February 12, 2015. Ex. 1001, at [54], [45], [21], [22]. The '752 patent is a continuation of U.S. Patent Application No. 12/057,775, filed on March 28, 2008. The '752 patent claims priority to U.S. Provisional Application No. 60/920,483 filed on March 28, 2007; U S. Provisional Application No. 60/975,058 filed on September 25, 2007; U.S Provisional Application No. 60/983,446, filed on October 29, 2007; and U.S. Provisional Application No. 61/024,072, filed on January 28, 2008. *Id.* [60].

The '752 patent teaches krill oil compositions characterized by having "high amounts of phospholipids, astaxanthin esters and/or omega-3

contents." Ex. 1001, Abstract. According to the specification, the compositions disclosed in the '752 patent are effective "in a number of areas such as anti-inflammation, antioxidant effects, improving insulin resistances and improving blood lipid profile." *Id.*

The '752 patent acknowledges that krill oil compositions, including compositions having up to 60% w/w phospholipid content and as much as 35% w/w EPA/DHA content, were known in the art at the time of the invention. *Id.* at col. 1, ll. 52–57. In addition, the '752 patent recognizes that a myriad of health benefits have been attributed to krill oil in the prior art. For example, the '752 patent states that "[k]rill oil compositions have been described as being effective for decreasing cholesterol, inhibiting platelet adhesion, inhibiting artery plaque formation, preventing hypertension, controlling arthritis symptoms, preventing skin cancer, enhancing transdermal transport, reducing the symptoms of premenstrual symptoms or controlling blood glucose levels in a patient." *Id.* at col. 1, ll. 46–52.

E. Illustrative Claims

Claims 1 and 14 are illustrative of the challenged claims. Claim 1 reads as follows:

> 1. A polar krill oil comprising greater than about 40% phosphatidylcholine w/w of said krill oil and greater than about 5% ether phospholipids w/w of said krill oil.

Ex. 1001, col. 34, ll. 65–67.

Claim 14 reads as follows:

> 14. A *Euphausia superba* krill oil comprising greater than about 45% phosphatidylcholine w/w of said krill oil, greater than about 5% ether phospholipids w/w of said krill oil, less than about 25% triglycerides w/w of said krill oil, at least 36% omega-3 fatty acids w/w of said krill oil, and astaxanthin.

Id. at col. 36, ll. 1–11.

F. Evidence

Petitioner relies on the following references:

Catchpole and Tallon, WO 2007/123424 A1, published Nov. 1, 2007 ("Catchpole") (Ex. 1009).[1]

F. Sampalis, WO 03/011873 A2, published Feb. 13, 2003 ("Sampalis") (Ex. 1013).

Grynbaum et al., *Unambiguous detection of astaxanthin and astaxanthin fatty acid esters in krill (Euphausia superba Dana),* 28 J. Sep. Sci. 1685 (2005) ("Grynbaum") (Ex. 1039).

Randolph et al., US 2005/0058728 A1, published Mar. 17, 2005 ("Randolph") (Ex. 1011).

Enzymotec, GRAS Notice No. GRN 000226 for "Krill-based Lecithin in Food" and "Krill-derived lecithin" https://www.fda.gov/downloads/Food/Ingredients PackagingLabeling/GRAS/NoticeInventory/ucm263930.pdf, dated May 26, 2007, and filed by the FDA May 29, 2007 ("Enzymotec") (Ex. 1048).

[1] Catchpole claims priority to NZ 546681, filed April 20, 2006. Ex. 1009 (30).

G. Asserted Grounds

Petitioner asserts that claims 1–20 are unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1, 5, 6, 11	102(e)	Catchpole
4, 7, 12, 13	103(a)	Catchpole, Sampalis
8–10	103(a)	Catchpole, Grynbaum, Randolph
1–3, 5, 6, 11	103(a)	Catchpole, Enzymotech
14–16, 20	103(a)	Catchpole, Enzymotech, Sampalis
17–19	103(a)	Catchpole, Enzymotech, Sampalis, Grynbaum, Randolph

II. ANALYSIS

A. Legal Standards

To prevail in its challenges to the patentability of all claims of the ’752 patent, Petitioner must demonstrate by a preponderance of the evidence that the claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d) (2017). “In an [inter partes review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid. Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016); see also 35 U.S.C. § 312(a)(3) (requiring inter partes review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”). That burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015); *see also In re Magnum Oil Tools*

Int'l, Ltd., 829 F.3d 1364, 1375–78 (Fed. Cir. 2016) (discussing the burden of proof in *inter partes* review).

"Anticipation requires that all of the claim elements and their limitations are shown in a single prior art reference." *In re Skvorecz*, 580 F.3d 1262, 1266 (Fed. Cir. 2009). "[U]nless a [prior art] reference discloses within the four corners of the document not only all of the limitations claimed but also all of the limitations arranged or combined in the same way as recited in the claim, it cannot be said to prove prior invention of the thing claimed and, thus, cannot anticipate under 35 U.S.C. § 102." *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1371 (Fed. Cir. 2008).

A claim is unpatentable for obviousness if, to one of ordinary skill in the pertinent art, "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made." 35 U.S.C. § 103(a) (2006); *see also KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including the scope and content of the prior art, any differences between the claimed subject matter and the prior art, the level of ordinary skill in the art, and objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). A petitioner cannot satisfy its burden of proving obviousness by employing "mere conclusory statements." *Magnum Oil*, 829 F.3d at 1380. Moreover, a decision on the ground of obviousness must include "articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). "An obviousness determination requires finding both 'that a skilled artisan would have been motivated to combine the teachings of the prior art references to

achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so.'" *CRFD Research, Inc. v. Matal*, 876 F.3d 1330, 1340 (Fed. Cir. 2017) (quoting *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367– 1368 (Fed. Cir. 2016)). "The reasonable expectation of success requirement refers to the likelihood of success in combining references to meet the limitations of the claimed invention." *Intelligent Bio-Sys., Inc.*, 821 F.3d at1367. A reasonable expectation of success "does not require absolute predictability of success . . . all that is required is a reasonable expectation of success." *In re Kubin*, 561 F.3d 1351, 1360 (Fed. Cir. 2009) (quoting *In re O'Farrell*, 853 F.2d 894, 903–04 (Fed. Cir. 1988)).

We analyze Petitioner's asserted grounds of unpatentability in accordance with the above-stated principles.

B. Level of Ordinary Skill in the Art

We consider the asserted grounds of unpatentability in view of the understanding of a person of ordinary skill in the art, and thus we begin by addressing the level of ordinary skill in the art. The level of skill in the art is a factual determination that provides a primary guarantee of objectivity in an obviousness analysis. *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 1324 (Fed. Cir. 1999) (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966); *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991)).

According to Petitioner, a person of ordinary skill in the art at the time of the invention would have held

> an advanced degree in marine sciences, biochemistry, organic (especially lipid) chemistry, chemical or process engineering, or associated sciences with complementary understanding, either through education or experience, of organic chemistry and in particular lipid chemistry, chemical or process engineering,

> marine biology, nutrition, or associated sciences; and knowledge of or experience in the field of extraction. In addition, a POSITA would have had at least five years applied experience.

Pet. 6–7 (citing Ex. 1006 ¶¶ 33–34).

At institution, we preliminarily adopted Petitioner's definition of an ordinarily skilled artisan, and determined that the prior art itself was sufficient to demonstrate the level of ordinary skill in the art at the time of the invention. Inst. Dec. 8. We note that Patent Owner states that it "accepts [Petitioner's] definition of a POSITA." PO Resp. 15. Accordingly, for this Decision, we adopt Petitioner's definition, while maintaining that the prior art demonstrates the appropriate level of ordinary skill in the art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the prior art, itself, can reflect appropriate level of ordinary skill in art). Moreover, we have reviewed the credentials of Drs. Tallon and Hoem, and consider each of them to be qualified to provide their opinion on the level of skill and the knowledge of a person of ordinary skill in the art at the time of the invention.

C. Claim Construction

Having defined the ordinarily skilled artisan, we now turn to claim construction. For petitions filed before November 13, 2018—as here—the Board interprets claims in an unexpired patent using the "broadest reasonable construction in light of the specification of the patent." 37 C.F.R. § 42.100(b) (2017);[2] *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131,

[2] The amendment to this rule does not apply here because the Petition was filed before November 13, 2018. *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial

2144–46 (2016). Under that standard, we presume that a claim term carries its "ordinary and customary meaning," which "is the meaning that the term would have to a person of ordinary skill in the art in question" at the time of the invention. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007) (citation omitted). We need not explicitly interpret every claim term for which the parties propose a construction. *See* 35 U.S.C. § 314(a); *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) ("[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy."); *see also Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (applying *Vivid Techs.* in the context of an *inter partes* review).

1. "greater than about 5% w/w ether phospholipids"

Claim 1 requires the polar krill oil to comprise "greater than about 5% w/w ether phospholipids." Ex. 1001, 34, ll. 67–68. The parties offer different claim constructions for that phrase. Pet. 22–27; PO Resp. 12–14. Petitioner asserts that the broadest reasonable interpretation of the phrase "greater than about 5%" w/w is "greater than 4.5% ether phospholipids." Pet. 26–27 (citing Ex. 1006 ¶¶ 166–68). According to Petitioner, the whole number values referenced in the Specification for the ether phospholipid content of krill oil "are also accurate only to within the rounding values," such that a person of ordinary skill in the art would have understood that "because the claimed ether phospholipid values are modified by the word 'about,' those values encompass a range extending 0.5% below the claimed numerical limitation, (e.g., 4.5% which is rounded up to 5%)." *Id.* at 26.

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and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (amending 37 C.F.R. § 42.100(b) effective November 13, 2018).

Patent Owner notes that Petitioner's declarant, Dr. Tallon, acknowledges in his declaration that the values for total phospholipids and ether phospholipids provided in Examples 7 and 8 of the Specification "are accurate to a tenth of a percent." PO Resp. 13 (citing Ex. 1006 ¶ 72). Patent Owner asserts that, based on Dr. Tallon's testimony, and "applying the rounding rationale proposed by Petitioner, the actual rounding should be from the tenth of a percent. Thus, 4.95% would round up to 5.0% and be included in the term 'about 5%.'" *Id.* at 13–14. Accordingly, Patent Owner contends that the broadest reasonable interpretation of the phrase "greater than about 5% w/w" is "greater than 4.95% ether phospholipids w/w of said krill oil." *Id.* (citing Ex. 2001 ¶ 37).

As noted by Petitioner, the Board construed the phrase "greater than about 5%" w/w as meaning "greater than 4.5%" w/w in a Final Written Decision addressing similar claims of a related patent. Pet. Reply 5. Specifically, in IPR2018-00295, the Board's analysis of the claim phrase "greater than about 5% w/w" of krill oil in the Final Written Decision reads as follows:

> Such broadening usages as 'about' must be given reasonable scope; they must be viewed by the decision maker as they would be understood by persons experienced in the field of the invention. Although it is rarely feasible to attach a precise limit to 'about,' the usage can usually be understood in light of the technology embodied in the invention." *Modine Mfg. Co. v. U.S. Int'l Trade Comm'n*, 75 F.3d 1545, 1554 (Fed. Cir. 1996).
>
> After considering the parties' arguments and reviewing the Specification of the '765 patent, we conclude that Petitioner's proposed construction is consistent with the intrinsic evidence. Although the '765 patent does not explicitly address the issue of "about," the meaning of the term can be discerned from a careful reading of the Specification. Example 8 of the '765 patent reports the analysis of phospholipid

> fractions of a product of the invention and a commercially available Krill product. Ex. 1001, col. 31, l, 46–col. 32, l. 42. Table 22, reproduced above, reports the calculated values for the various phospholipids in values to a tenth of a percent. *Id.* at col. 32, ll. 18–38. In the discussion of the table, the values are rounded to the nearest whole number, not the nearest tenth. *Id.* at col. 32, ll. 11–15. This is consistent with the approach advanced by Petitioner.

IPR2018-00295, Paper 35, 12.[3]

Similarly here, we find that although the Specification does not explicitly define the term "about," its meaning may be discerned from the manner by which the Specification refers to reported values for phospholipid profiles of krill oil. Ex. 1001, 32:18–44 (Table 22). In the discussion of the lipids reported in Table 22, the values are rounded to the nearest whole number, not the nearest tenth. *Id*. at 32:47–52. This is more consistent with the approach advanced by Petitioner than by Patent Owner. Thus, as determined in that Final Written Decision, and for the reasons set forth therein, "the term 'greater than about 5% w/w' shall be construed to mean 'greater than 4.5% w/w.'" IPR2018-00295, Paper 35, 13.

2. "Greater than about 40% phosphatidylcholine"

Applying the same analysis, we construe the term "greater than about 40% phosphatidylcholine" to mean greater than 39.5% phosphatidylcholine.

Although Petitioner and Patent Owner propose additional claim constructions, we determine that explicit construction of those additional claim terms is not necessary for purposes of this Decision.

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[3] Patent Owner has requested a rehearing in response to the Final Written Decision entered in IPR2018-00295. *Id*. at Paper 36. However, the rehearing request is limited to issues involving the denied motion to amend claims, and does not challenge the Board's construction of any claim term.

D. Ground 1 - Anticipation by Catchpole

Petitioner contends that claims 1, 5, 6, and 11 are unpatentable under 35 U.S.C. §102(e) as anticipated by Catchpole. Pet. 28–34.

1. Catchpole[4]

Catchpole discloses "a process for separating lipid materials containing phospholipids" (Ex. 1009, 1, ll. 5–6) in order to produce a product containing "desirable levels of particular phospholipids" (*id*. at 3, ll. 27–28). Catchpole states that phospholipids "have been implicated in conferring a number of health benefits including brain health, skin health, eczema treatment, anti-infection, wound healing, gut microbiota modifications, anti-cancer activity, alleviation of arthritis, improvement of cardiovascular health, and treatment of metabolic syndromes. They can also be used in sports nutrition." *Id*. at 1, l. 29–2, l. 2. Catchpole further discloses that products having high levels of particular phospholipids "may be employed in a number of applications, including infant formulas, brain health, sports nutrition and dermatological compositions." *Id*. at 25, ll. 9–13.

Catchpole describes products that preferably contain greater than 5% acylalkyphospholipids[5], more preferably greater than 10% acylalkyphospholipids, and most preferably greater than 25% acylalkyphospholipids. *Id.* at 9, ll. 18–21.

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[4] Petitioner contends that Catchpole qualifies as prior art to the '752 patent pursuant to pre-AIA § 102(a) and §102(e). Pet. 8–9, n.2; Ex. 1006 ¶ 40. Patent Owner has not contended otherwise. *See* PO Resp. 15–17. For purposes of this decision we conclude that Catchpole is prior art under pre-AIA §§ 102(a) and (e).

[5] Alkylacylphospholipids and acylalkyphospholipids are also known as ether phospholipids. Exhibit 1006 ¶¶ 210, 212, 214.

Catchpole describes, in Example 18, the fractionation of krill lipids from krill powder using a process that employs supercritical CO_2 in a first extraction, and a CO_2 and absolute ethanol mixture in a second. *Id*. at 24, ll. 1–16. Table 16, reproduced below, reports the phospholipid concentrations present in the krill oil extract obtained by Catchpole.

Table 16

	Yield % of feed	Composition, %							
		PC	PI	PS	PE	CL	AAPC	AAPE	Other compounds
Feed		6.6	0.0	0.0	0.4	0.1	0.6	0.1	78.6
Extract 2	4.3	39.8	0.0	0.0	0.3	0.2	4.6	0.2	53.7
Residue	79.2	3.6	0.0	0.0	0.3	0.2	0.5	0.1	93.4

As shown in Table 16 above, which reports the phospholipid concentrations present in the krill oil extract obtained by Catchpole, the composition of Extract 2 includes 39.8% phosphatidylcholine ("PC"). *Id*. at Table 16. The ether phospholipids alkylacylphosphatidylcholine ("AAPC") and alkylacylphosphatidylethanolamine ("AAPE") were also present in Extract 2, representing 4.6% and 0.2%, respectively, of the extracted composition for a total of 4.8% ether phospholipids. *Id*.; Ex 1006 ¶¶ 145, 146.

2. Analysis of Claims 1 and 11

As shown above, claim 1 recites a krill oil composition comprising greater than about 40% phosphatidylcholine w/w of said krill oil and greater than about 5% ether phospholipids w/w of said krill oil. Petitioner contends that the krill oil composition disclosed in Table 16 of Catchpole meets these limitations in that Extract 2 contained 39.8% phosphatidylcholine and 4.8% ether phospholipids. Pet. 33–34 (citing Ex. 1009, 24, ll. 17–19). Petitioner contends that, as used in claim 1, the terms "about 40%" and "about 5%" embrace the values of 39.8% and 4.8% respectively. *Id.* Petitioner relies on

the testimony of Dr. Tallon to support this contention. Ex. 1006 ¶¶ 166–168.

Claim 11 depends from claim 1 and adds the limitation that the krill oil composition is for oral administration to a human. Ex. 1001, col. 35, ll. 25–26. Petitioner contends that the compositions of Catchpole meet this limitation as Catchpole discloses that compositions can be employed in baby food and sports nutrition. Pet. 35 (citing Ex. 1009, 25, ll. 9–13). Petitioner relies on the testimony of Dr. Tallon to support this contention. Ex. 1006 ¶¶ 217–218.

Patent Owner contends that Catchpole does not anticipate claims 1 and 11 as Catchpole does not disclose a krill oil composition having greater than about 5% ether phospholipids. PO Resp. 15–17. Patent Owner's argument is premised on its construction of the term "greater than about 5%" as meaning 4.95% or greater. *Id.*

As discussed above, we have declined to adopt Patent Owner's construction of the term "greater than about 5%" and have construed the term to mean greater than 4.5%. Catchpole discloses a krill oil composition having 4.8% by weight ether phospholipids, which is within the range of "greater than about 5%." Ex. 1009, 16, Table 16; Ex. 1002 ¶ 226.

We also agree with Petitioner that Catchpole discloses a krill oil composition that contains greater than about 40% phosphatidylcholine. Table 16 of Catchpole, reproduced above, reports a phosphatidylcholine (PC) level of 39.8 %. Ex. 1009, 24. This is within the range of "greater than about 40%."

With respect to claim 11, Catchpole teaches that the compositions described therein can be used in infant formulas and sports nutrition.

Ex. 1009, 25. Thus, we agree that the compositions in Catchpole are for human oral consumption.

Based on the foregoing we conclude that Petitioner has established by a preponderance of the evidence that claims 1 and 11 are anticipated by Catchpole.

3. Analysis of Claims 5 and 6

Claims 5 and 6 depend from claim 1 and recite the limitation that the ether phospholipid is present in amounts greater than about 6% and greater than about 7% respectively. Ex. 1001, col. 35, ll. 10–15. Petitioner contends that Catchpole anticipates these claims in that Catchpole discloses that the compositions can be prepared from marine animals such as Krill and preferably contain greater than 10% acylalkyphospholipids. Pet. 34–35 (citing Ex. 1009, 9 and 35). Petitioner also contends that Catchpole claims compositions prepared from marine animals that contain greater than 5% or greater than 10% acylalkyphospholipids. *Id.* (citing Ex. 1009, 31 and 35, claims 40, 95 and 96). Petitioner also supports this contention with the testimony of Dr. Tallon. Ex. 1006 ¶¶ 213–261, 424.

Patent Owner contends that Catchpole does not anticipate claims 5 and 6 as Catchpole does not disclose a krill oil composition containing greater than about 6 or greater than about 7% ether phospholipids. PO Resp. 17–18. Patent Owner contends that while Catchpole teaches that the compositions described therein may have an ether phospholipid content greater than 5% or greater than 10%, there is nothing in Catchpole that links that teaching to the krill oil compositions disclosed in Catchpole. *Id.*

We have considered the arguments of the parties and the evidence of record and conclude that claims 5 and 6 are not anticipated by Catchpole. While we agree with Petitioner that Catchpole teaches compositions that can

contain greater than 10% acylalkyphospholipids, we do not agree that Catchpole discloses a krill oil composition having that amount of acylalkyphospholipids. Catchpole teaches a method of separating lipid materials from a feed material. Ex. 1009, 4. The feed material used in Catchpole may be derived from "terrestrial animals, marine animals, terrestrial plants, marine plants, or micro-organisms such as microalgae, yeast and bacteria. Preferably the feed material is derived from sheep, goat, pig, mouse, water buffalo, camel, yak, horse, donkey, llama, bovine or human." *Id.* at 7. Catchpole does not specifically disclose a Krill extract that contains greater than 10% acylalkyphospholipids. The only specific disclosure of the acylalkyphospholipid content of krill oil is in Table 16 discussed above, which discloses an acylalkyphospholipid content of 4.8%, less than the 6% and 7% recited in claims 5 and 6.

Based on the foregoing we conclude that claims 5 and 6 are not anticipated by Catchpole.

E. Ground 2 - Obviousness Based on Catchpole Combined with Sampalis

Petitioner contends that the subject matter of claims 4, 7, 12, and 13 would have been obvious to one of ordinary skill in the art at the time the invention was made over Catchpole combined with Sampalis.

1. Sampalis

Sampalis discloses the preparation of phospholipid compositions from natural marine or aquatic sources. Ex. 1013. Sampalis teaches that the preferred source for the phospholipid compositions is krill such as *Euphausia superba*. *Id.* at 25. Sampalis teaches that the phospholipid compositions have a phospholipid content of "at least 40% w/w, preferably at least 45% w/w. More preferably, the amount of phospholipid is from

about 45-60% w/w." *Id.* at 26.[6]

Sampalis teaches that the phospholipid composition may also contain fatty acids with omega-3 and omega-6 fatty acids preferred. *Id.* Sampalis teaches "Polyunsaturated fatty acids, in particular omega-3 fatty acids, preferably make up at least 15% w/w, more preferably at least 40% w/w, and even more preferably at least 45% w/w, of the total lipids in the extract." *Id.* at 28.

Sampalis teaches that the phospholipid compositions may also contain antioxidants such as astaxanthin. *Id.* at 30. Sampalis teaches that the phospholipid composition can be in the form of foods, beverages, energy bars, sports drinks, supplements and the like. *Id.* at 35. Sampalis teaches that the compositions can be in the form of a capsule. *Id.*

2. Analysis of Claims 4, 7, 12, and 13

Claim 4 further defines claim 1 wherein the krill oil composition includes at least about 36% omega-3 fatty acids by weight of the krill oil composition. Ex. 1001, col. 35, ll. 7–9. Petitioner relies on Sampalis as teaching this claim requirement, asserting that Sampalis teaches a krill oil composition comprising between 15% w/w and 45% w/w omega-3 fatty acids. Pet. 36 (Citing Ex. 1013, 30). Petitioner also asserts that a person of ordinary skill in the art would have had a reason to combine the omega-3-fatty acid levels taught in Sampalis with the krill oil disclosed in Catchpole because of the known significant health benefits of omega-3-fatty acids. Pet. 39 (citing Ex. 1006 ¶¶ 93, 94, 97, and 99).

[6] Citations are to the page number of the references.

Claim 7 further defines Claim 1, wherein the krill oil includes astaxanthin. Ex. 1001, col. 35, ll. 16–17. Petitioner relies on Sampalis for a teaching of this requirement. Pet. 36–37 (citing Ex. 1013, 36).

Claim 12 further defines claim 1, wherein the polar krill oil is extracted from *Euphausia Superba*. Ex. 1001, col. 36, ll. 1–2. Petitioner relies on Sampalis for a teaching of this requirement. Pet. 38 (citing Ex. 1013, 25).

Claim 13 further defines claim 1, wherein the krill oil is in a capsule. Ex. 1001, col. 36, l. 3. Petitioner relies on Sampalis as teaching this requirement. Pet. 38–39 (citing Ex. 1013, 37).

Patent Owner contends that the subject matter of the claims would not have been obvious over Catchpole combined with Sampalis as neither reference teaches an ether phospholipid level of greater than about 5%. PO Resp. 19–20. Patent Owner reiterates its argument that greater than about 5% should be construed to mean 4.95% or greater and that Catchpole only teaches an ether phospholipid level of 4.8%. *Id.* Patent Owner argues that Sampalis does not teach a level of ether phospholipid. *Id.*

Patent Owner also contends that the references do not provide a reasonable expectation of success in combining the references to produce a krill oil composition containing greater than about 5% ether phospholipids. PO Resp. 20–21. Patent Owner argues one skilled in the art would recognize that the level of ether phospholipids recited in Catchpole represented a highly enriched amount of ether phospholipids and that further enrichment would not be possible. *Id.*

Patent Owner also contends that one skilled in the art would not have been motivated to increase the ether phospholipid levels of the krill oil composition of Catchpole as the art teaches away from increasing the levels.

PO Resp. 21–22. Patent Owner argues that the art taught that ether phospholipids could be converted compounds with potent inflammatory Platelet Activation Factor ("PAF") activity. *Id.* Patent Owner contends that one skilled in the art would not have increase the level of ether phospholipids to avoid a potential inflammatory effect. *Id.*

In its Reply, Petitioner contends that collateral estoppel precludes Patent Owner from advancing arguments Petitioner contends were previously rejected in Final Written Decisions by the Board. Pet. Reply 4–5. Petitioner contends that Catchpole teaches ether phospholipid levels of greater than about 5%. Pet. Reply 10 (citing Ex. 1001, 9). Petitioner also contends that one skilled in the art would have known how to increase the ether phospholipid levels of the compositions disclosed in Catchpole and thus would have had a reasonable expectation of success in making the claimed compositions. Pet. Reply 10–11 (citing Ex. 1009, 11 and 18–19, Ex. 1086 ¶¶ 33–39, 63–106, and 311). Petitioner argues that the art does not teach away from using ether phospholipids. Pet. Reply 11–15 (citing Ex. 1086 ¶¶ 138–145 and 150). Accordingly, we address those issues in the following analysis.

a) Collateral Estoppel – PAF Teaching Away

"Collateral estoppel protects a party from having to litigate issues that have been fully and fairly tried in a previous action and adversely resolved against a party-opponent." *Ohio Willow Wood Co. v. Alps South, LLC*, 735 F.3d 1333, 1342 (Fed. Cir. 2013) (citing *Pharmacia & Upjohn Co. v. Mylan Pharm., Inc.*, 170 F.3d 1373, 1379 (Fed Cir. 1999)). "It is well established that collateral estoppel, also known as issue preclusion, applies in the administrative context." *MaxLinear, Inc. v. CF CRESPE LLC*, 880 F.3d 1373, 1376 (Fed. Cir. 2018) (citations omitted); *Webpower, Inc. v. WAG*

Acquisition, *LLC*, IPR2016-01239, Paper 21 at 26–28 (PTAB Dec. 26, 2017) (Final Written Decision). The application of collateral estoppel is not limited to patent claims that are identical. *Ohio Willow Wood*, 735 F.3d at 1342. "Rather, it is the identity of the issues that were litigated that determines whether collateral estoppel should apply. . . . If the differences between the unadjudicated patent claims and the adjudicated patent claims do not materially alter the question of invalidity, collateral estoppel applies." *Id.*

As our reviewing court has explained, collateral estoppel precludes a party from relitigating an issue if:

> (1) prior action presents an identical issue; (2) the prior action actually litigated and adjudged that issue; (3) the judgment in that prior action necessarily required determination of the identical issue; and (4) the prior action featured full representation of the estopped party.

VirnetX Inc. v. Apple, Inc., 909 F.3d 1375, 1377 (Fed. Cir. 2018) (quoting *Stephen Slesinger, Inc. v. Disney Enters., Inc*., 702 F.3d 640, 644 (Fed. Cir. 2012)).

Petitioner asserts that collateral estoppel precludes Patent Owner from advancing the same patentability arguments rejected in the Board's Final Written Decisions in IPR2018-00295, IPR2017-00745, and IPR2017-00746. Pet. Reply 4. Although those decisions addressed different patents and claims,[7] Petitioner asserts that the challenged claims recite many of the same

[7] As mentioned above in Section I. C., "Related Matters," challenged claims of the '765 patent were shown to be unpatentable in IPR2018-00295, challenged claims of the '905 patent were shown to be unpatentable in IPR2017-00745, and challenged claims of the '877 patent were shown to be unpatentable in IPR2017-00746.

limitations, and are materially identical to the claims found to be unpatentable in those earlier Final Written Decisions. *Id.* For example, Petitioner asserts that the challenged claims shown to be unpatentable in the ’765, ’877, and ’905 patents “recite krill oil with materially identical ranges of ether phospholipids, phosphatidylcholine and astaxanthin.” *Id.* Further, Petitioner notes that the ’752 patent is in the same family and shares the same specification and priority date as the ’765, ’877, and ’905 patents. *Id*. at 4 n.2. Additionally, Petitioner asserts that the same prior art asserted here was previously relied upon by the Board to conclude that the claims of the related patents are unpatentable. *Id*. at 5.

Petitioner asserts that Patent Owner’s argument that the prior art teachings that ether lipids such as those found in krill could be converted to compounds having potent inflammatory Platelet Activating Factor (“PAF”) activity would have led an ordinarily skilled artisan away from producing a krill oil composition for oral consumption comprising the recited amounts of ether phospholipids should be precluded because the Board rejected that “PAF teaching away” argument in the Final Written Decision in IPR2018-00295, Paper 35, 39–47, IPR2017-00746, Paper 23, 53–61, and IPR2017-00745, Paper 24, 29–38. Pet. Reply 2–3.

Based upon our review of those prior Final Written Decisions, we find persuasive Petitioner’s contention that Patent Owner’s “PAF teaching away” argument was presented, litigated, and adjudged in one or more of those proceedings. As noted above in Sections I. B. and C., two of those Final Written Decisions have been affirmed by the Federal Circuit. Further, we find that the patentability analysis in the prior Final Written Decisions necessarily required determination of the “PAF teaching away” issue raised by Patent Owner, who was fully represented in each of those proceedings.

Thus, we agree with Petitioner that collateral estoppel applies so as to preclude Patent Owner from relitigating here its assertions that a person of ordinary skill in the art would not have had a reason to combine the cited art with a reasonable expectation of success based upon its "PAF teaching away" argument.

b) Greater Than About 5% Ether Phospholipids.

Claims 4, 7, 12, and 13 depend from claim 1 and contain the limitation that the krill oil composition contains greater than about 5% w/w ether phospholipids. Ex. 1001, col. 35, ll. 7–9, 16–17 and col. 36, ll, 1–3. As discussed above, for purposes of this decision, we have construed the term "greater than about 5% w/w phospholipids" to include 4.5% w/w phospholipids.

For the reasons discussed above we conclude that Catchpole teaches this limitation.

c) Likelihood of Success

Patent Owner contends that one skilled in the art would not have had a reasonable expectation of success in producing a krill oil composition having greater than about 5% ether phospholipids. PO Resp. 20–21. Patent Owner argues that one skilled in the art would have recognized that the extraction technique reported in the krill oil example of Catchpole removed much if not all of the neutral lipids. *Id.*; Ex. 2001 ¶¶ 49 and 52. Patent Owner contends that since all the neutral lipids had been removed, it would not be possible to further increase the level of ether phospholipids. PO Resp. 20; Ex. 2001 ¶ 79.

Petitioner responds that one skilled in the art would have had a reasonable expectation of success in creating a krill oil composition having greater than about 5% ether phospholipids in that Catchpole expressly

teaches such a composition. Pet. Reply. 10. In addition, Petitioner contends that one skilled in the art would have understood that further enrichment of the krill oil composition is possible as the extract contained 53.7% other compounds that would include neutral lipids that could be extracted. Pet. Reply 10–11; Ex. 1086 ¶¶ 63–74, 78–79, 94–106. Patent Owner contends that Catchpole teaches that the extraction conditions can be "readily varied depending on the desired composition of the resulting extract." Pet. Reply 11; Ex. 1009, 11.

We have considered the arguments of the parties and conclude that a person of ordinary skill in the art would have had a reasonable expectation of success in creating a krill oil product having greater than about 5% ether phospholipids.

As Petitioner points out, Catchpole specifically teaches a krill oil composition having 4.8% ether phospholipids, within the claimed range. Pet. Reply 10–11; Ex. 1009, 24. With respect to the ability to further extract ether phospholipids from the starting material reported in Table 2 of Catchpole, both Dr. Tallon and Dr. Hoem testified that the remaining extract contained additional neutral lipids which would include ether phospholipids. Ex. 1086 ¶¶ 63–74, 78–79, 94–106; Ex. 1145, 150–151. Finally, one skilled in the art would have understood Catchpole as teaching that a CO_2 extraction step can be used to vary the neutral lipid composition of the extract. Our finding is supported by Catchpole's express disclosure that "[t]he feed material can be processed using pure CO_2 before the co-solvent is introduced to remove much or all of neutral lipids," thereby enriching soluble phospholipid content. Ex. 1009, 11. In addition, Dr. Tallon has testified that "the relative proportions of a natural krill and hence the natural krill constituents could be varied in predictable ways by applying a single solvent

or combination of solvents including supercritical fluid extraction to selectively extract specific groups of lipid components." Ex. 1086 ¶ 311.

Based on the foregoing analysis, we conclude that Petitioner has established by a preponderance of the evidence that claims 4, 7, 12, and 13 are unpatentable over Catchpole combined with Sampalis.

F. Ground 3 – Obviousness Based on Catchpole Combined with Grynbaum and Randolph

Petitioner asserts that the subject matter of claims 8–10 would have been obvious over Catchpole combined with Grynbaum and Randolph.

1. Grynbaum

Grynbaum reports the results of a series of experiments to detect and measure the presence of astaxanthin and astaxanthin fatty acid esters in krill. Ex. 1039, 1685. Grynbaum reports that the extraction technique used resulted in an extract containing 7842 μg/g astaxanthin fatty acid esters. *Id.*

2. Randolph

Randolph discloses a composition to "treat diseases and/or abnormal conditions associated with inflammatory response, for example cardiovascular conditions, arthritis, osteoporosis and Alzheimer's disease." Exhibit 1011, Abstract; ¶ 5. Randolph teaches that the composition may contain krill oil obtained from *Euphausia superba*. *Id.* ¶ 39. Randolph also teaches that the composition "can contain any amount of an astaxanthin ingredient. For example, at least about 1 percent (e.g., at least about 2, 3, 4, 5, 10, 15, 20, 25, 30, 35, 40, 50, 60, 70, 80, or 90 percent) of a dietary supplement can be astaxanthin." *Id.* ¶ 44.

3. Analysis

Claims 8–10 further define claim 1, wherein the krill oil includes greater than 1000 mg/kg, greater than 1500 mg/kg and greater than 2000

mg/kg of astaxanthin esters. Ex. 1001 col. 35, ll. 19–24. Petitioner relies on Grynbaum for a teaching of this requirement, asserting that Grynbaum teaches preparing an extract from krill that comprises 7842 μg/g (equivalent of 7842 g/kg) astaxanthin fatty acid esters. Pet. 43 (citing Ex. 1039, 1 and 3). Petitioner also contends that Randolph teaches preparing a krill oil composition having as low as 1% of an astaxanthin ingredient, which equates to 10,000 mg/kg. Pet. 44–45 (citing Ex. 1011, 6). Petitioner supports this argument by referring to Patent Owner's admission in prior proceedings that 1% of an astaxanthin ingredient is equivalent to 10,000 mg/kg. *Id.*; Ex. 1105, 18–19; Ex. 1106, 38–39. Petitioner further asserts that a person of ordinary skill in the art would have had a reason to combine the astaxanthin levels taught in Grynbaum and Randolph with the krill oil disclosed in Catchpole because of the known significant health benefits of astaxanthin. Pet. 46–47 (citing Ex. 1006 ¶¶ 76, 89, 218, 297, 334, 402, 439, 450, and 488).

Patent Owner repeats its assertions that the references do not teach a krill oil composition having at least about 5% ether phospholipids; that one skilled in the art would not have had a reasonable expectation of success in creating a krill oil composition having greater than about 5% ether phospholipids; and that the art teaches away from making such a composition. PO Resp. 22–23.

We have considered the combined teachings of the cited references for this ground, along with Petitioner's arguments and Dr. Tallon's testimony and, based on the record as a whole, we determine that, for the reasons stated above, Petitioner has established by a preponderance of the evidence that claims 8–10 are unpatentable over Catchpole combined with Grynbaum and Randolph.

G. GROUND 4 – Obviousness Based on Catchpole Combined with Enzymotec

Petitioner asserts that the subject matter of claims 1–3, 5–6, and 11 would have been obvious over Catchpole combined with Enzymotec.

1. Enzymotec[8]

Enzymotec is a submission by Enzymotec Ltd. to the FDA requesting a "Generally Recognized as Safe" (GRAS) exemption for the use of krill based lecithin extracts. Ex. 1048, 3. Enzymotec teaches that lecithin is phosphatidylcholine. *Id.* at 6–7. Enzymotec teaches that the use of various extraction techniques can be used to enrich the phospholipid fraction of a krill based extract creating what Enzymotec refers to as Grade B extract. *Id.* at 8. Enzymotec teaches that Grade B extracts contain from 60.2% to 82.5% phosphatidylcholine. *Id*. Table B-1, Appendix B. Enzymotec also discloses that Grade B extracts contain no detectable amount of triglycerides. *Id*.

2. Analysis

Claim 1 is directed to a polar krill oil composition that comprises greater than about 40% phosphatidylcholine w/w of said krill oil and greater than about 5% ether phospholipids w/w of said krill oil. Ex. 1001, col. 34, ll. 65–67. Petitioner relies on Catchpole and Enzymotec as teaching these requirements, asserting that Catchpole teaches krill oil compositions

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[8] Petitioner contends that Enzymotec is a printed publication in that the submission to the FDA was publically accessible to persons of ordinary skill exercising reasonable diligence before the effective filing date of the '752 patent. Pet. 9–13. In support of its contention that Emzymotec is a printed publication,Petitioner offers the testimony of Drs. McQuate and Kapoor. *Id*.; Ex. 1044;
Ex. 1045. Patent Owner does not contest the fact the Enzymotec is a printed publication. *See* PO Resp. 24– 31. For purposes of this Decision, we find that Petitioner has demonstrated that Enzymotec is a printed publication.

comprising greater than about 5% ether phospholipids and that Enzymotec teaches forming krill extracts with greater than 45% phosphatidylcholine. Pet. 49–54 (citing Ex. 1048, 53). Petitioner further asserts that a person of ordinary skill in the art would have had a reason to combine the teachings of Catchpole with Enzymotec because of the known significant health benefits of claimed components. *Id.* at 56 (citing Ex. 1006 ¶¶ 93, 94, 97, and 99).

Claim 2 further defines claim 1, wherein the krill oil comprises greater than 45% phosphatidylcholine w/w of the krill oil. Ex. 1001, col. 35, ll. 1–3. Petitioner relies on Enzymotec for this requirement as Enzymotec teaches krill extracts comprising 60% phosphatidylcholine or greater. Pet. 55 (citing Ex. 1048, 53 and Ex. 1006 ¶¶ 452–456).

Claim 3 further defines claim 1, wherein the krill oil comprises less than 25% triglycerides. Ex. 1001, col. 35, ll. 4–6. Petitioner relies on Enzymotec for this requirement as Enzymotec teaches krill extracts having no detectable amounts of triglycerides. Pet. 55 (citing Ex. 1048, 17).

Claims 5 and 6 depend from claim 1 and recite the limitation that the ether phospholipid is present in amounts greater that about 6% and greater that about 7% respectively. Ex. 1001, col. 35, ll. 10–15. Petitioner contends that Catchpole anticipates these claims in that Catchpole discloses that the compositions can be prepared from marine animals such as krill and preferably contain greater than 5% acylalkyphospholipids. Pet. 55–56 (citing Ex. 1009, 9). Petitioner also contends that Catchpole claims compositions prepared from marine animals that contain greater than 5% or greater than 10% acylalkyphospholipids. *Id.* (citing Ex. 1009, 9). Petitioner supports this contention with the testimony of Dr. Tallon. Ex. 1006 ¶¶ 461–463.

Claim 11 depends from claim 1 and adds the limitation that the krill oil composition for oral administration to a human. Ex. 1001, col. 35, ll. 25–26. Petitioner contends that the compositions of Catchpole meet this limitation as Catchpole discloses that compositions can be employed in baby food and sports nutrition. Pet. 56 (citing 1009, 25). Petitioner relies on the testimony of Dr. Tallon to support this contention. Ex. 1006 ¶¶ 465–467.

Patent Owner contends that

> claims 1-3, 5-6 and 11 are not obvious over the combined references because at least: 1) the combined references do not teach the ether phospholipid content of the claimed krill oil; 2) there is no reasonable expectation of success in either increasing the ether phospholipid content of Catchpole Extract 2 or using the reported ether phospholipid content of Catchpole Extract 2 to predict the ether phospholipid content of the Enzymotec Grade B krill lecithin; 3) there is no motivation to combine references such as Catchpole and Enzymotec where the lipid profiles of the krill extracts were clearly different and incompatible; and 4) the prior art as a whole teaches away from increasing ether phospholipid content in krill oil.

PO Resp. 31.

In its Reply, Petitioner asserts that Catchpole teaches krill oil compositions having "greater than about" 5%, 6%, and 7% ether phospholipids. Pet. Reply 19 (citing Ex. 1009, 9). Petitioner also asserts that one skilled in the art would have had a reasonable expectation of success in creating a krill oil composition with the recited amounts of ether phospholipids and the art does not teach away from compositions with the recited amounts of ether phospholipids. *Id.* at 20–24.

We have considered the arguments of the parties and the evidence of record and conclude the Petitioner has shown by a preponderance of the

evidence that claims 1–3, 5, 6, and 11 are unpatentable over Catchpole combined with Enzymotec.

Patent Owner's arguments with respect to no reasonable expectation of success and teaching away are the same as those presented above. For the reasons set forth in Section II. E above, we are not persuaded by these arguments.

Similarly, with respect to claims 1–3 and 11, Patent Owner's argument regarding greater than about 5% ether phospholipids is a reiteration of its previous arguments. Again, as explained above, we are not persuaded by these arguments. Catchpole teaches a krill oil composition having 4.8% ether phospholipids, which is "greater than about" 5% ether phospholipids.

Claims 5 and 6 contain limitations calling for ether phospholipid levels of 6% and 7% respectively. Ex. 1001, Col. 35, ll. 10–15. While we agree with Patent Owner that Catchpole does not disclose a specific krill oil composition having these amounts of ether phospholipids, Catchpole does teach:

> More preferably the product comprises greater than 5% acylalkyphospholipids and/or plasmalogens. Even more preferably the product comprises greater than 10% acylalkyphospholipids and/or plasmalogens. Most preferably the product comprises greater than 25% acylalkyphospholipids and/or plasmalogens.

Ex. 1009, 9. As we concluded in our earlier decision, "it would have been obvious to prepare a krill oil composition from greater than 5% to 8% ether phospholipids." IPR 2018-00295, Paper 35, 65. Moreover, as Dr. Tallon has testified, one skilled in the art would have understood from the teachings

of Catchpole that the krill oil composition disclosed in Enzymotec contains 8–9.7% ether phospholipids. Ex. 1006 ¶ 242; Ex. 1086 ¶ 61.

Patent Owner contends that one skilled in the art would not have combined the teachings of Catchpole and Enzymotec because Catchpole and Enzymotec use extraction techniques that result in different and non-compatible lipid profiles. PO Resp. 29–30. We are not persuaded by this argument.

As Petitioner points out, the present claims are directed to a product, not a method for making the product. *See, e.g.,* Ex. 1001, col. 34, ll. 65–67 ("A krill oil comprising . . ."). Noting in the challenged claims limits the product to a specific extraction technique or process. Thus any process or combination of processes can be used to produce the claimed products. As Dr. Tallon has testified, one skilled in the art would have understood how to achieve the desired levels of components by selectively extracting the different components and blending the extracts in known and predictable ways to produce the desired composition. Ex. 1006 ¶ 49.

This is consistent with the teachings of the '752 patent. The '752 patent teaches separately extracting polar and neutral lipids and then blending the two extracts together to produce a krill oil composition. Ex. 1001, col. 12, ll. 3–36. The Specification provides no further guidance regarding the blending step but instead relies on the knowledge of those skilled in the art. This supports Dr. Tallon's conclusion that one skilled in the art would have known how to combine the different lipid fractions to achieve the claimed composition.

With respect to the compatibility of the two extracts, we note that while Patent Owner has shown that they are different in composition, Patent

Owner has not advanced any credible evidence of record to show the extracts are incompatible. *See* PO Resp. 29–31.

Accordingly, based on the record before us, we are persuaded that one skilled in the art would have combined the teachings of the references to produce the claimed compositions. We conclude that Petitioner has established by a preponderance of the evidence that claims 1–3, 5, 6, and 11 are unpatentable over Catchpole combined with Enzymotec.

H. Ground 5 – Obviousness Based on Catchpole, Enzymotec and Sampalis

Petitioner contends that the subject matter of claims 14–16 and 20 would have been obvious over Catchpole combined with Enzymotec and Sampalis.

Claim 14 is the other independent claim of the ’752 patent. It reads:

> 14. A *Euphausia superba* krill oil comprising greater than about 45% phosphatidylcholine w/w of said krill oil, greater than about 5% ether phospholipids w/w of said krill oil, less than about 25% triglycerides w/w of said krill oil, at least 36% omega-3 fatty acids w/w of said krill oil, and astaxanthin.

Ex. 1001, col. 36, ll. 4–8. Petitioner contends that Catchpole teaches the preparation of krill oils with greater than about 5% ether phospholipids, Sampalis teaches krill oil preparations contain astaxanthin and Enzymotec teaches krill extract can contain greater than 45% phosphatidylcholine and less than 25% triglycerides. Pet. 59–61 (citing Ex. 1009, 35; Ex. 1048, 9 and 17). Petitioner contends that one skilled in the art would have been motivated to combine the teachings of the reference to enhance the health benefits of the resulting product. Pet. 62–64 (citing Ex. 1006 ¶¶ 200, 2005, 211, and 271–218).

Claims 15 and 16 further define claim 14 and recite the limitation that the ether phospholipid is present in amounts greater than about 6% and

greater than about 7%, respectively. Ex. 1001, col. 36, ll. 9–11, 12–14. Petitioner relies on Catchpole as teaching these limitations. Pet. 62 (citing Ex. 1009, 9 and 35).

Claim 20 further defines claim 14, wherein the krill oil is in a capsule. Ex. 1001, col. 26, ll. 24–25. Petitioner relies on Sampalis as teaching this requirement. Pet. 62 (citing Ex. 1013, 37).

In response, Patent Owner reiterates the arguments made with respect to Ground 4. *See* PO Resp. 34–35. For the reasons stated above, Patent Owner's arguments are unpersuasive.

We conclude that Petitioner has shown by a preponderance of the evidence that claims 14–16 and 20 are unpatentable over Catchpole combined with Enzymotec and Sampalis.

I. Ground 6 – Obviousness Based on Catchpole Combined with Enzymotec, Sampalis, Grynbaum, and Randolph

Petitioner asserts that claims 17–19 are unpatentable under 35 U.S.C. § 103(a) over Catchpole, Enzymotec, Sampalis, Grynbaum, and Randolph.

Claims 17–19 further define claim 14, wherein the krill oil comprises astaxanthin in amounts greater than 1000 g/kg, 1500g/kg, or 2000 g/kg of krill oil, respectively. Ex. 1001, col. 36, ll. 14–22. Petitioner relies on the teachings of Grynbaum and Randolph for these requirements. Pet. 64–68 (citing Ex. 1039, 1685, Ex. 1011, ¶ 44).

In response, Patent Owner reiterates the arguments made with respect to Ground 4. *See* PO Resp. 34–35. For the reasons stated above, Patent Owner's arguments are unpersuasive.

We conclude that Petitioner has shown by a preponderance of the evidence that claims 17–19 are unpatentable over Catchpole combined with Enzymotec, Sampalis, Grynbaum and Randolph.

III. PATENT OWNER'S MOTION TO AMEND

Patent Owner's motion to amend is contingent on the Board's finding of unpatentability of the challenged claims. MTA 1. Because we conclude that Petitioner has demonstrated that the challenged claims are unpatentable, we proceed to consider Patent Owner's motion to substitute claims 21–29 for claims 1–4, 11–14, and 20.[9] For the reasons discussed below, Patent Owner's motion to amend is denied.

A. Applicable Law

In an *inter partes* review, claims may be added as part of a proposed motion to amend. 35 U.S.C. § 316(d). The Board must assess the patentability of the proposed substitute claims "without placing the burden of persuasion on the patent owner." *Aqua Prods., Inc. v. Matal*, 872 F.3d 1290, 1328 (Fed. Cir. 2017) (en banc); *see Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 15 at 3–4 (PTAB Feb. 25, 2019). Patent Owner's proposed substitute claims, however, must still meet the statutory requirements of 35 U.S.C. § 316(d) and the procedural requirements of 37 C.F.R. § 42.121 as a threshold matter. *See* USPTO's Memorandum, Guidance On Motions to Amend in view of *Aqua Products* (Nov. 2017), *available at* https://www.uspto.gov/sites/default/files/documents/guidance_on_motions_to_amend_11_2017.pdf. Accordingly, Patent Owner must demonstrate: (1) the amendment proposes a reasonable number of substitute claims; (2) the amendment does not seek to enlarge the scope of the claims of the patent or

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[9] In the Motion to Amend, Patent Owner cancels claims 5–10 and 15–19. MTA App'x A.

introduce new subject matter; (3) the amendment responds to a ground of unpatentability involved in the trial; and (4) the original disclosure sets forth written description support for each proposed claim. *See* 35 U.S.C. § 316(d)(1)(B),(3); 37 C.F.R. § 42.121; *Lectrosonics*, Paper 15 at 4–8.

B. The Proposed Substitute Claims

Proposed substitute claims 21–29 are reproduced below with markings showing proposed changes from claims 1–4, 11–14, and 20 respectively. Deletions are shown in brackets and additions are underlined.

> Proposed Claim 21. (Proposed substitute claim in place of original claim 1.) A polar krill oil comprising greater than about 40% phosphatidylcholine w/w of said krill oil, [and greater than about 5%] from 6% to 10% ether phospholipids w/w of said krill oil, and from 100 to 700 mg/kg astaxanthin esters.
>
> Proposed Claim 22. (Proposed substitute claim in place of original claim 2.) The polar krill oil of claim 21 [1], wherein said polar krill oil comprises greater than about 45% phosphatidylcholine w/w of said krill oil.
>
> Proposed Claim 23. (Proposed substitute claim in place of original claim 3.) The polar krill oil of claim 21 [1], wherein said polar krill oil comprises less than about 25% triglycerides w/w of said krill oil.
>
> Proposed Claim 24. (Proposed substitute claim in place of original claim 4.) The polar krill oil of claim 21 [1], wherein said polar krill oil comprises at least 36% omega-3 fatty acids w/w of said krill oil.
>
> Proposed Claim 25. (Proposed substitute claim in place of original claim 11.) The polar krill oil of claim 21 [1], wherein said krill oil is suitable for oral administration to a human.

> Proposed Claim 26. (Proposed substitute claim in place of original claim 12.) The polar krill oil of claim 21 [1], wherein said krill oil is extracted from *Euphausia superba*.
>
> Proposed Claim 27. (Proposed substitute claim in place of original claim 13.) A capsule comprising the polar krill oil of claim 21 [1].
>
> Proposed Claim 28. (Proposed substitute claim in place of original claim 14.) A *Euphausia superba* krill oil comprising greater than about 45% phosphatidylcholine w/w of said krill oil, [greater than about 5%] from 6% to 10% ether phospholipids w/w of said krill oil, less than about 25% triglycerides w/w of said krill oil, at least 36% omega-3 fatty acids w/w of said krill oil, and from 100 to 700 mg/kg astaxanthin esters [astaxanthin].
>
> Proposed Claim 29. (Proposed substitute claim in place of original claim 20.) A capsule comprising the *Euphausia superba* krill oil of claim 28 [14].

C. Claim Construction

We construe only those terms that are in controversy, and only to the extent necessary to resolve the controversy. *See Vivid Techs., Inc. v. Am. Sci. Engr., Inc*, 200 F.3d 795, 803 (Fed. Cir. 1999); *see also Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (applying *Vivid Techs*. in the context of an *inter partes* review). None of the newly added claim terms are in controversy, so no claim construction is required.

D. Broadening, Definiteness, and Written Description

For the reasons discussed below, we determine that the substitute claims do not broaden the invention and that substitute claims 21–29 are definite and have adequate written description support.

1. The Substitute Claims Do Not Broaden the Scope of the Claims

Proposed claims 21 and 28 remove the term "greater than about" and add a limit of 6% to 8% by weight for the ether phospholipid present in the krill oil composition, and also remove the term "greater than about" and limit the astaxanthin present to 100 to 700 mg/kg astaxantin esters. The remaining proposed claims depend from either claims 21 or 28 and also include these limitations. These changes narrow the amounts of ether phospholipids and astaxanthin present in the krill oil composition and do not broaden the scope of the claims.

2. The Substitute Claims Are Not Indefinite

As with the original claims, the terms recited in the substitute claims are well understood by those skilled in the art. We find that the claims are definite.

3. The Substitute Claims Are Supported by the Specification

Patent Owner contends that the added limitations of from 5% to 8% ether phospholipids and from 100 to 700 mg astaxanthin are supported by the present Specification and find support in U.S. Patent Application No. 14/020,155 ("the '155 Application"). MTA 3–7. Patent Owner contends that both the '155 Application and the present Specification teach that the krill oil compositions of the invention may comprise "from about 1%, 2%, 3% or 4% to about 8%, 10%, 12% or 15% w/w ether phospholipids or greater than about 4%, 5%, 6%, 7%, 8%, 9% or 10% ether phospholipids." Ex. 2012, 16; MTA 5. Patent Owner also contends that the present examples support this limitation, especially Example 7. MTA 5.

Similarly, Patent Owner contends that the present Specification and the '155 Application support the upper limit of astaxanthin. MTA 7–8. Both the '155 Application and the Specification teach, "in some

embodiments, the krill oil compositions comprise greater than about 100, 200, 300, 400, or 500 mg/kg astaxanthin esters and up to about 700 mg/kg astaxanthin esters." Ex. 2012, 16–17; *see id.* at Tables 17C, 19C, and 20C.

Petitioner does not contest that the Specification and the '155 Application provide written support for the amended claim limitations.

Based on the foregoing, we conclude that the new claim limitations are supported by the Specification and do not introduce new matter.

E. Unpatentability

Petitioner asserts that proposed substitute claims 21–29 are unpatentable under 35 U.S.C. § 103(a). MTA Opp. 1. Petitioner contends that the subject matter of substitute claims 21 and 24–27 would have been obvious to one of ordinary skill in the art over Catchpole combined with Sampalis, NKO,[10] and Randolph. *Id.* at 16. Petitioner contends that the subject matter of claims 22, 23, 25, 28, and 29 would have been obvious over Catchpole combined with Enzymotec, Sampalis, NKO, and Randolph. *Id.* at 21. Finally, Petitioner contends that the subject matter of claims 21–29 would have been obvious over Catchpole combined with Enzymotec, Sampalis, NKO, and Randolph. *Id.* at 24. To support its Opposition, Petitioner offers the declaration of Dr. Tallon. Ex. 1086. Patent Owner disagrees. MTA Reply 1–10. Patent Owner relies on the declaration of Dr. Hoem to support its position. Ex. 2025.

We determine that claims 21 and 24–27 would have been obvious over the combination of Catchpole, Sampalis, NKO, and Randolph. We

[10] NKO refers to Neptune Krill Oil referenced in Sampalis, Ex. 1012, 4, and described as prior art in the present Specification, Ex. 1001, col. 27, ll. 38–49.

determine that claims 22, 23, 25, 28, and 29 would have been obvious over the combination of Catchpole, Enzymotec, Sampalis, NKO, and Randolph. We determine that claims 21–29 would have been obvious over the combination of Catchpole, Enzymotec, Sampalis, NKO, and Randolph.

In support of its contention that the substitute claims would have been obvious, Petitioner reiterates the arguments discussed above with respect to the original claims and presents new arguments addressing the amended limitations relating to the claimed amount of ether phospholipids and astaxanthin esters. As with the original claims, Patent Owner's response focuses on the issues of the skilled artisan's motivation to combine and reasonable expectation of success in making the claimed subject matter. Patent Owner also addresses the amended limitations regarding ether phospholipids and astaxanthin esters. We shall focus our discussion on these issues.

1. From 6% to 10% Ether Phospholipids

The arguments presented by the parties are essentially the same as those presented for the original claims above with respect Ground 3. *See* Section II. F above. For the reasons stated above, we conclude that Petitioner has shown by a preponderance of the evidence that the claim limitation calling for 6% to 10% ether phospholipid is taught by Catchpole.

2. 100mg/kg to 700 mg/kg of Astaxanthin Ester.

Substitute claims 21 and 28 add the limitation calling for 100 to 700 mg of astaxanthin. Petitioner contends that this limitation is taught by Randolph, Sampalis, and NKO. Petitioner contends that Randolph teaches that the disclosed compositions can have any amount of astaxanthin ester and that one skilled in the art would have understood that Randolph teaches an astaxanthin level as low as 158 mg. MTA Opp. 11–12. Petitioner

supports this contention with the testimony of Dr. Tallon. Ex. 1086 ¶¶ 250–256; Ex. 2020, 154–155.

Petitioner contends that Sampalis discloses a Krill oil composition having 20 mg/100ml of astaxanthin, which equates to 190 mg of astaxanthin esters. MTA Opp. 12 (citing Ex. 1013, 30, ll. 1–7). Petitioner supports this contention with the testimony of Dr. Tallon. Ex. 1086 ¶¶ 257–261.

Petitioner also contends that the ’752 patent discloses a prior art krill oil formulation, NKO, which has an astaxanthin level of 472 mg. MTA Opp. 12 (citing Ex. 1001, col. 27, ll. 50–59). Petitioner contends that Patent Owner has admitted that the NKO product was the closest prior art. *Id.* (citing Ex. 1002, 36; Ex. 1004, 34; Ex. 1005, 36).

Patent Owner contends that the Board has already found that the NKO product does not provide the claimed range of astaxanthin and that other references support the conclusion that the NKO product has an astaxanthin level in excess of 1000 mg. MTA Reply 10.

Patent Owner also contends that Randolph does not teach a krill oil composition with an astaxanthin ester level within the claimed range. *Id.* at 11. Patent Owner argues that Randolph’s teaching is for the disclosed compositions in general and is not specific to krill oil compositions. *Id.* Patent Owner also argues that Dr. Tallon improperly chose values for astaxanthin and krill oil at the extremes of the disclosed ranges in making his calculations. *Id.*

With respect to Sampalis, Patent Owner contends that one skilled in the art would not have interpreted Sampalis as teaching a krill oil product having an astaxanthin level within the claimed range. MTA Reply 11–12.

Patent Owner contends that one skilled in the art would not have been motivated to prepare a krill oil composition with the claimed amount of

astaxanthin esters as the art teaches compositions having in excess of 1000 mg/kg. MTA 17–18. Specifically Patent Owner asserts that Grynbaum and Randolph each teach krill oil compositions having significantly more than 700 mg/kg astaxanthin esters. *Id*. Patent Owner also contends that the higher level of astaxanthin esters taught in Grynbaum and Randolph teach away from the range recited in the substitute claims. *Id*.

In its Sur-Reply, Petitioner asserts that Dr. Tallon has testified that the NKO products contain different levels of lipids. MTA Sur-Reply 8. Petitioner maintains that it does not contend that all commercial NKO products inherently contain 100 to 700 mg of astaxanthin ester, but that the product that Patent Owner admits is prior art contains an amount of astaxanthin ester falling within that range. *Id.* at 8–9. Petitioner contends that Patent Owner's admission can be used to support an obviousness determination. *Id.* at 9.

Petitioner contends that Randolph discloses compositions that can contain up to 3000 mg of krill oil and from 0.5 to 50 mg of astaxanthin. *Id.* at 10. Petitioner argues that Dr. Tallon properly used the endpoints of the ranges to calculate the amount of astaxanthin ester taught by Randolph. *Id.* Petitioner argues that Patent Owner has offered no support for its contention that Dr. Tallon's use of the endpoints was improper. *Id.*

With respect to Sampalis, Petitioner contends that Sampalis teaches that the products can be made from krill and that antioxidants, such as astaxanthin ester, are present in an amount of at least 20 mg/100 ml. MTA Sur-Reply, 11, Ex. 1013, 27, 13; Ex. 1086 ¶¶ 312–316. Petitioner also disputes Patent Owner's contention that one skilled in the art would have discredited the teachings of Sampalis because of alleged inconsistencies. MTA Sur-Reply 11–12.

Viewed as a whole, we determine that a preponderance of the evidence demonstrates that it would have been obvious to one of ordinary skill in the art to prepare a krill oil composition having from greater than 100mg/kg to 700mg/kg astaxanthin esters.

First we consider the admitted prior art of the NKO product. Although we agree with Petitioner that the sample tested by Patent Owner shows an astaxanthin ester level of 472 mg, we are not persuaded that the subject matter of the claims would have been obvious based on that evidence.

Petitioner's argument is premised on the proposition that the NKO product would inherently have an astaxanthin level with the range recited in the substitute claims. Although inherency may be used to support a conclusion of obviousness, our reviewing court has warned that the use of inherency in an obviousness context "must be carefully circumscribed." *PAR Pharm. Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1195 (Fed Cir. 2014). To support a conclusion that a property is inherent, Petitioner must show that the astaxanthin ester level is necessarily present in the NKO product. *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999). As Patent Owner has shown, the GRAS statement filed by Neptune[11] lists an astaxanthin ester level of greater than 1500 mg/kg. Ex. 1075, 9–10. Dr. Tallon also testified that, other than the data in the '765 patent, he was not aware of any other analysis of the NKO product that showed astaxanthin levels for the NKO product that were within the range recited in the substitute claims. Ex. 2020, 149–150.

[11] Neptune Technologies & Bioresources ("Neptune").

Based on the foregoing we find that Petitioner has failed to establish that the NKO product would inherently have an astaxanthin level of from 100 mg/kg to 700 mg/kg.

We now turn to Randolph. Randolph teaches:

> A composition can contain any amount of an astaxanthin ingredient. For example, at least about 1 percent (e.g., at least about 2, 3, 4, 5, 10, 15, 20, 25, 30, 35, 40, 50, 60, 70, 80, or 90 percent) of a dietary supplement can be astaxanthin. Typically, a composition contains between about 0.5 mg and about 50 mg of an astaxanthin ingredient.

Ex. 1011 ¶ 44. Randolph also teaches that the composition typically contains about 300 mg to about 3000 mg of krill oil. *Id.* ¶ 40. Neptune teaches that the astaxanthin in krill oil is mainly present as esterified astaxanthin. Ex. 1013. Dr. Tallon testified that, assuming that 95% of the astaxanthin present in the composition of Randolph is esterified, the amount of astaxanthin ester ranges as low as 158 mg/kg. Ex. 2020, 155–157.

Turning to Sampalis, Sampalis teaches krill oil compositions that contain antioxidants including esterified asatxanthin in amounts from 20 to 200 mg/ml. Ex. 1013, 32. As Dr. Tallon has testified, this equates to a range having a lower limit of 190 mg/kg, overlapping with the range recited in the proposed claims. Ex. 1086 ¶¶ 257–259.

Patent Owner's contention that one skilled in the art would have discounted the teachings of Sampalis based on alleged inconsistencies in Table 5 of Sampalis is unpersuasive. Even if we were to accept Patent Owner's contention that it is impossible for a krill oil extract to contain canthaxaxanthin, this does not negate Sampalis's explicit teaching that the extract can contain at least about 20mg/100ml of astaxanthin.

Based on the foregoing, we conclude that it would have been obvious to one of ordinary skill in the art to prepare a krill oil composition with between 100 mg/kg and 700 mg/kg of astaxanthin esters. Although we agree with Patent Owner that Randolph and Sampalis teach levels higher than 1000 mg/kg, as demonstrated above, when read as a whole, Randolph and Sampalis also teach lower amounts that overlap with the range recited in the substitute claims. "A prima facie case of obviousness typically exists when the ranges of a claimed composition overlap the ranges disclosed in the prior art." *In re Peterson*, 315 F.3d 1325, 1329 (Fed. Cir. 2003).

With respect to the motivation to use the lower amount of astaxanthin ester, Randolph teaches that the composition may contain any amount of astaxanthin and that 0.5 to 50 mg is typical. Ex. 1011 ¶ 44. One skilled in the art would have wanted to ensure a sufficient level of astaxanthin ester to take advantage of its antioxidant properties. *See* Ex. 1006 ¶ 287; Ex. 1086 ¶¶ 262–265.

While we agree with Patent Owner that some of the references teach higher levels of astaxanthin esters, we do not find those references to teach away from using a lower level of astaxanthin ester. Expressed preference for certain embodiments within disclosed a genus does not teach away from the rest of the embodiments within that genus. *In re Susi*, 440 F.2d 442, 446 n.3 (CCPA 1971).

We conclude that substitute claims 21 and 24–27 would have been obvious over the combination of Catchpole, Sampalis, and Randolph. We conclude that substitute claims 22, 23, 25, 28, and 29 would have been obvious over the combination of Catchpole, Enzymotec, Sampalis, and Randolph. We conclude that substitute claims 21–29 would have been

obvious over the combination of Catchpole, Enzymotec, Sampalis, and Randolph.

IV. CONCLUSION[12]

We conclude that Petitioner has shown by a preponderance of the evidence that (1) claims 1 and 11 are unpatentable as anticipated by Catchpole, (2) claims 4, 7, 12, and 13 are unpatentable over the combination of Catchpole, and Sampalis, (3) claims 8–10 are unpatentable over the combination of Catchpole, Grynbaum and Randolph, (4) claims 1–3, 5–6, and 11 are unpatentable over the combination of Catchpole and Enzymotec, (5) claims 14–16 and 20 are unpatentable over the combination of Catchpole, Enzymotec, and Sampalis, and (6) claims 17–19 are unpatentable over the combination of Catchpole, Enzymotec, Samplais, Grynbaum, and Randolph.

We deny Patent Owner's contingent Motion to Amend to replace claims 1–4, 11–14, and 20 with substitute claims 21–29 for claims, as those claims are unpatentable over the cited prior art.

[12] Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding.* *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, based on a preponderance of the evidence, claims 1–20 of the ’752 patent are unpatentable;

FURTHER ORDERED, Patent Owner’s Motion to Amend is denied as to replacing claims 1–4, 11–14, and 20 with substitute claims 21–29; and

FURTHER ORDERED, because this is a final written decision, the parties to this proceeding seeking judicial review of our Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

In summary:

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
1, 5, 6, 11	102(e)	Catchpole	1, 11	5, 6
4, 7, 12, 13	103	Catchpole, Sampalis	4, 7, 12, 13	
8–10	103	Catchpole, Grynbaum, Randolph	8–10	
1–3, 5, 6, 11	103	Catchpole. Enzymotec	1–3, 5, 6, 11	
14–16, 20	103	Catchpole, Enzymotec, Sampalis	14–16, 20	
17–19	103	Catchpole, Enzymotec, Sampalis, Grynbaum, Randolph	17–19	
Overall Outcome			1–20	

Motion to Amend Outcome	**Claims**
Original Claims Cancelled by Amendment	
Substitute Claims Proposed in the Amendment	21–29
Substitute Claims: Motion to Amend Granted	
Substitute Claims: Motion to Amend Denied	21–29
Substitute Claims: Not Reached	

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EXHIBIT 13

[ENTIRELY REDACTED]